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TM 9-226

U.S. WAR DEPARTMENT

U.S. Dept. of Army
TECHNICAL MANUAL

**BROWNING MACHINE GUN,
CALIBER .50, M2, WATER-COOLED,
AND MOUNTS**



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CHANGES }
No. 1 }

WAR DEPARTMENT,
WASHINGTON, May 16, 1942.

TECHNICAL MANUAL

BROWNING MACHINE GUN, CALIBER .50, M2, WATER-COOLED, AND MOUNTS

TM 9-226, December 10, 1940, is changed as follows:

25. Care and cleaning of gun.—*a. Cleaning bore.*—(1) Disassemble groups from gun. The bore should be cleaned thoroughly with rifle bore cleaner. This cleaner is a combination solvent and preservative which is issued for use by troops in the field for cleaning small arms. For specifications of cleaners, oils, and rust-preventive compounds, see TM 9-850 and SNL K-1.

(a) To use rifle bore cleaner, saturate a clean patch with rifle bore cleaner and push it back and forth through the bore of the barrel by means of a cleaning rod. Repeat the operation with clean patches two or three times, and then use a clean dry patch to remove all the cleaner before applying the prescribed lubricating oil, preservative, light.

(b) Lubricating oil, preservative, light (if unavailable, lubricating oil for aircraft instruments and machine guns), should be used to protect the bore if the weapon is to remain out of service for several days. For long-time storage, rust-preventive compound, light, should be used in place of oil. See *d* below. However, before use, the gun should be cleaned thoroughly and recoiled with lubricating oil, preservative, light.

(2) When rifle bore cleaner is not available, proceed as follows: Place barrel, muzzle down, in a vessel containing hot water and issue soap or a soda ash and water solution (1½ tablespoons per pint of water), or, lacking these, hot or cold water alone.

* * * * *

c. Cleaning tripod.

* * * * *

(2) For the antiaircraft machine-gun mount, caliber .50, M2, use lubricating oil, preservative, light. If not available, use lubricating oil for aircraft instruments and machine guns. Lubricate the slide of the recoil mechanism through the oil hole located in the top of the slide. The slide should be lubricated every

*These changes supersede section III, Training Circular No. 71, War Department, 1941.

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2 hours during continuous firing. The elevating and traversing screw should be oiled with a few drops of oil every day.

d. Preparation for storage.

* * * * *

(2) Apply rust-preventive compound, **light**, to all metal parts of the gun. Rust-preventive compound, **light**, is to be used on guns for both temporary and permanent storage. It may be applied with a brush or by dipping. In applying, heating is not necessary except in very cold temperatures. Application of the rust-preventive compound * * * whenever the weapon is not in use.

* * * * *

g. Lubricating oil.—(1) (a) Proper oiling is second in importance only to intelligent cleaning. It is a vital necessity * * * and the ways of the belt feed slide.

(b) Lubricating oil, preservative, **light**, has preservative as well as lubricating properties, and care should be taken to use it where permissible. If lubricating oil, preservative, **light**, is not available, lubricating oil for aircraft instruments and machine guns may be used. However, the latter oil must not be considered as a preservative. In a warm, humid atmosphere, metal surfaces covered with lubricating oil for aircraft instruments and machine guns will not be suitably protected against rusting. Lubricating oil, preservative, **light**, should always be used for preserving the bore between firings, after the barrel has been cleaned.

Note.—All guns which are not protected with rust-preventive compound must be inspected periodically for signs of rust, the interval between inspections depending upon local climatic conditions.

(2) If the gun is to be fired in areas where the temperature is 45° F. or above, oil, **sperm**, should be used when available. When not available, **engine oil**, **SAE 10**, or any light grade machine oil may be used in an emergency.

(3) On all types of machine guns, when operated in areas where the temperature is below 45° F., oil, **lubricating, for aircraft instruments and machine guns**, should be used.

(4) For lubricating the M2 mount, **sperm oil** (U. S. Army Spec. No. 2-45A) or aircraft instrument and machine-gun lubricating oil should be used under the same conditions as in the case of the gun. If either of these is not available, any suitable motor oil or machine oil may be used.

[A. G. 062.11 (11-26-41) (3-20-42).] (C 1, May 16, 1942.)

26. Method of filling oil buffer.—Remove the oil buffer tube filling screws from the base of the buffer tube. Use the oil buffer filling oiler filled with aircraft instrument and machine-gun lubricating oil. Start the flow of oil by pressing on the base of the oiler. While the oil continues to pour * * * when the buffer tube is completely full.

[A. G. 062.12 (11-26-41).] (C 1, May 16, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
*Major General,
The Adjutant General.*

TECHNICAL MANUAL

BROWNING MACHINE GUN, CALIBER .50, M2,
WATER-COOLED, AND MOUNTS

CHANGES }
No. 2 }

WAR DEPARTMENT,
WASHINGTON, July 30, 1942.

TM 9-226, December 10, 1940, is changed as follows:

7. Description of antiaircraft machine-gun mount, caliber .50, M2.

* * * * *

b. (5) *Adjustment of recoil mechanism* (fig. 7).—(a) With the upper buffer recoil spring at its assembled length (2.09 inches) screw in the counter-recoil spring adjusting plug until its front face is $7\frac{9}{32}$ inches from the front faces of the trunnion slide assemblies. It will be found convenient to block the trunnion slide assembly to this height before assembling spring and plug to assure proper alinement of parts and ease of assembly. Screwing in the plug checks the gun * * * forward rear face of bracket (31) and the front of slide (25).

* * * * *

[A. G. 062.11 (7-17-42).] (C 2, July 30, 1942.)

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

TECHNICAL MANUAL }
No. 9-226 }

WAR DEPARTMENT,
WASHINGTON, December 10, 1940.

BROWNING MACHINE GUN, CALIBER .50, M2, WATER-COOLED, AND MOUNTS

Prepared under direction of the
Chief of Ordnance

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SECTION I

GENERAL

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1. Purpose.—This manual is published for the information and guidance of the using arms and services.

2. Scope.—*a.* This manual contains all the essential information of a technical character required by the using arms for the identification, use, and care of the particular matériel described. In addition to describing the weapon and its mounts, it contains all the essential information required by the using arms to identify, use, and care for the ammunition, spare parts, and accessories, sighting and fire control equipment, and cleaning and preserving material.

b. The disassembling outlined in this manual is the only disassembling which the using troops are authorized to perform.

3. References.—All manuals to be used in conjunction with this manual are shown in the Appendix.

4. Data.—*a. Machine gun.*

Weight of gun with water, 36-inch barrel	pounds..	110.00
Weight of gun with water, 45-inch barrel	do	121.50
Weight of gun without water, 36-inch barrel	do	94.00
Weight of gun without water, 45-inch barrel	do	100.50
Weight of barrel assembly, 36-inch barrel	do	14.50
Weight of barrel assembly, 45-inch barrel	do	17.08
Over-all length of gun, 36-inch barrel	inches..	57.00
Over-all length of gun, 45-inch barrel	do	65.93
Number of grooves in barrel		8
Rate of automatic fire	shots/minute..	500-650

b. Antiaircraft machine-gun mount, caliber .50, M2.

	Tripod type	Pedestal type
Weight of mount, complete-----pounds--	391. 50	323. 50
Weight of pedestal-----do----	94. 00	94. 00
Weight of tripod legs, each-----do----	40. 00	-----
Weight of pedestal base-----do----	-----	52. 00
Weight of cradle with pintle-----do----	113. 25	113. 25
Tripod spread, front to rear-----inches--	77. 00	-----
Tripod spread, right to left-----do----	90. 00	-----
Height from ground to center line of gun-----do----	49. 00	49. 00
Elevation, maximum-----degrees--	68. 75	68. 75
Depression, maximum-----do----	15. 00	15. 00
Traverse-----do----	360. 00	360. 00

c. Antiaircraft machine-gun tripod mount, M1.

Weight of mount, complete-----pounds--	284. 00
Weight of tripod group-----do----	191. 00
Weight of yoke, cradle, and shoulder stock group-----do----	93. 00
Tripod spread, all directions-----inches--	84. 00
Height from ground to center line of trunnions-----do----	65. 00
Elevation, maximum-----degrees--	80. 00
Depression, maximum-----do----	10. 00
Traverse-----do----	360. 00

d. Weight of ammunition chest and ammunition.

Chest, ammunition, caliber .50, M2, empty-----pounds--	29
Chest, ammunition, caliber .50, M2, loaded-----do----	89
200 links, caliber .50-----do----	8
200 cartridges, caliber .50, M1-----do----	52

5. Description of machine gun.—*a. General.*—The Browning machine gun, caliber .50, M2, water-cooled, is a recoil operated, belt fed, water-cooled machine gun. The metallic link, disintegrating belt is used in all firing of the gun.

b. For use with M2 mount.—For use with the M2 mount, guns of current manufacture are assembled with a flexible back plate assembly (D35272, fig. 1). This back plate assembly is identical with the back plate assembly described in *c* below except for the omission of the spade grips and the spade grip handle frame. Normally, the side plate trigger mechanism of the mount is used to fire the gun. Therefore, the flexible back plate serves as an additional means of firing the gun while the removal of the spade grips provides needed clearance. When guns

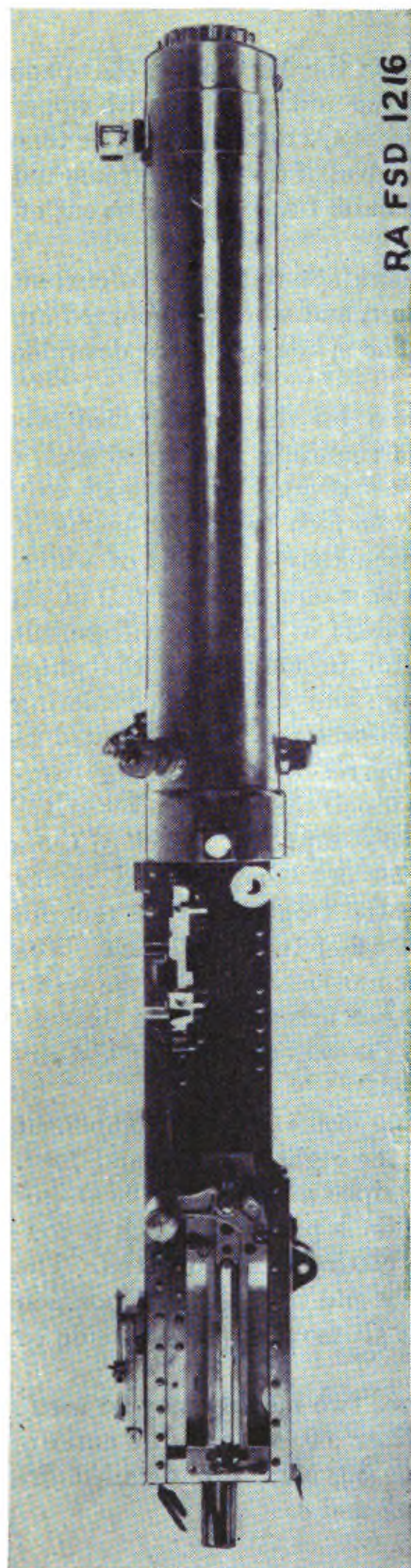


FIGURE 1.—Browning machine gun, caliber .50, M2, water-cooled (modified), right side view.

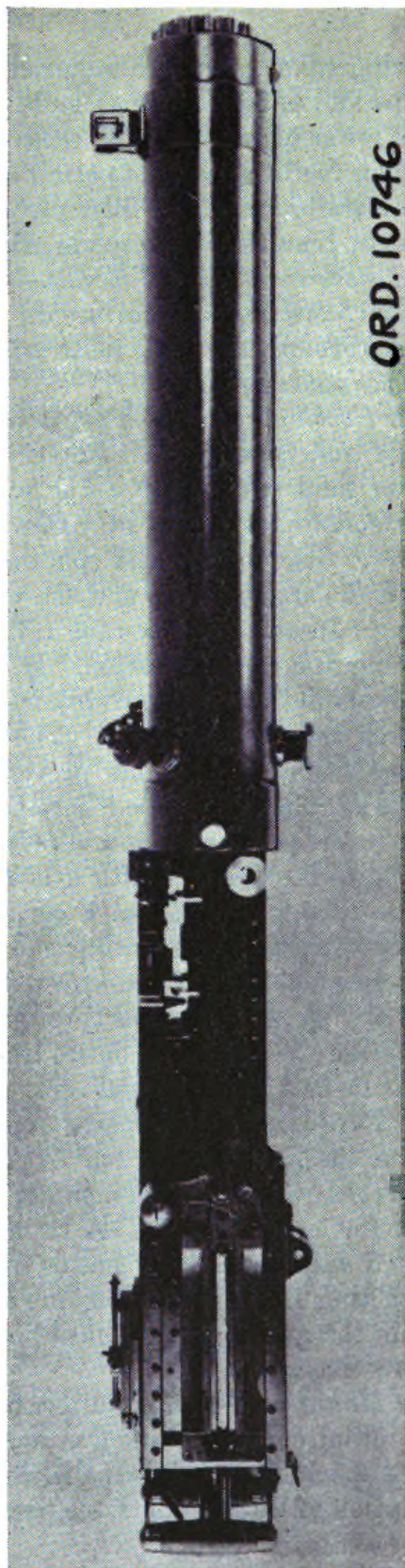


FIGURE 2.—Browning machine gun, caliber .50, M2, water-cooled, right side view.

having spade grips are required for use on the M2 mount, the spade grips and handle frames should be removed and replaced with upper and lower filler pieces. If these filler pieces are not available, or time and/or facilities will not permit of the removal of the handle frame and the installation of the filler pieces, the handle frame should be cut off thereby removing these spade grips.

c. For use with M1 mount.—Guns manufactured prior to current orders were intended for use on M1 mount, and when so mounted are fired through the back plate trigger. The spade grips are desirable but are not essential.

d. Cooling system.—The cooling system for the water-cooled machine gun consists of a water jacket surrounding the barrel and a water chest with pump. The water jacket of guns with 36-inch barrels contains 8 quarts of water and the 45-inch barrel 10 quarts of water. The water chest contains approximately 8 gallons of water. Both the water jacket and the water chest should be kept full at all times. In an emergency the full water jacket of the gun will permit cooling for short duration. However, for prolonged fire the water chest should always be coupled to the gun, and the entire circulating system kept full of water. The water absorbs the heat generated in firing the gun and thus prevents the barrel from becoming overheated. The steam tube is located in the top of the water jacket and is free to slide on the front and rear steam tube supports. Each of these supports is provided with a hole, the rear one being covered by the steam tube when the gun is elevated and the front one when the gun is depressed, thus preventing the escape of water from the jacket. The opposite hole, which is uncovered by this movement, allows the water and any steam generated through prolonged firing to escape through the steam tube and the outlet leading to the water supply or the circulating unit where any steam is condensed.

e. Feeding.—By properly repositioning some of the component parts, the gun may be fed from either the right or left hand feed. However, this gun when mounted on the tripod mounts must be assembled for left hand feed. A retracting slide is provided which is connected with the bolt by means of the retracting slide bolt stud. The retracting slide handle remains stationary and in a forward position while the gun is firing, thus eliminating all moving parts outside of the receiver.

f. Mounting.—For antiaircraft purposes two mounts may be used: the antiaircraft machine-gun mount, caliber .50, M2 and the antiaircraft machine-gun tripod mount, caliber .50, M1. For detailed description of these mounts, see paragraphs 7 and 8.

g. Sights.—The gun is equipped with the conventional machine-gun front and rear sights. (However, the M2 mount is equipped with sights which permit off-carriage control. For detailed description of this sight, see paragraph 7.)

(1) *Front sight.*—The front sight is the conventional blade type and is protected by the front sight cover.

(2) *Combination rear sight.*—The combination rear sight is the conventional leaf type sight. The sight is adjustable for windage. The drift is offset automatically by the construction of the rear sight leaf. The wind gage arc on the base is graduated in mils. The leaf is graduated in yards up to 3,200 yards for caliber .50, M1 ammunition with a muzzle velocity of 2,400 f/s. New leaf, now under manufacture, will be graduated for ammunition of 2,660 f/s muzzle velocity. Calibration of the sight leaf for ammunition of different muzzle velocities may be obtained by the use of the elevating screw which raises or lowers the slide 1 mil. By pressing in the half nut, instantaneous adjustment of the slide can be accomplished.

h. Recoil mechanism.—An oil buffer mechanism in the gun cushions the force of the recoiling part. The M2 mount includes a recoil mechanism of the spring type which absorbs the recoil of the gun and also a counterrecoil mechanism which absorbs the force of the recoil spring when the gun is returned to firing position. For further description of this recoil mechanism, see paragraph 7.

6. Operation of machine gun.—Operation as discussed herein is divided into two sections:

a. Manual operation.—Manual operation is that operation performed by the gunner.

(1) *To load.*—Loading may be considered to include two distinct operations; entering the loaded belt properly into the belt opening, and thereafter operating the mechanism of the gun until it is closed with the cartridge in the chamber and a cartridge in the feedway gripped by the extractor for extraction on the next recoil stroke. The double loop end of metallic link belt should always be inserted regardless of whether right or left hand feed is employed.

(a) The first of these operations may be performed with the cover either open or closed. In either case, enter the double loop end of the belt through the feed opening until the first cartridge is beyond the belt holding pawl. Close the cover, if open. Pull the bolt completely to the rear by means of the retracting slide and release it.

(b) The second operation consists of pulling the bolt once completely to the rear and then allowing it to spring forward. This opera-

tion must start with the action fully closed and the extractor gripping the cartridge in the feedway.

(2) *To unload.*—(a) Lift cover, remove belt, retract bolt, and make visual inspection of feedway, T-slot, and chamber to make certain that gun is unloaded.

(b) Release bolt and lower cover.

(c) Press trigger or sear mechanism to relieve tension on firing pin spring.

b. Mechanical operation.—Mechanical operation is that operation which is automatically performed by the gun itself when fired. The following explanation of mechanical operation begins with the gun assumed to be loaded and ready to fire. This explanation covers the mechanical operation of the gun itself. When fired from the anti-aircraft machine gun mount, caliber .50, M2, the recoil mechanism of the mount affects to a slight degree the mechanical operation described herein (see par. 7).

(1) *Side plate trigger action on first shot.*—When the side plate trigger slide is pulled to the rear the action of the side plate trigger cam forces the sear slide inward. This in turn forces the sear downward, releasing the sear notch from the shoulder of the firing pin. The firing pin spring forces the firing pin forward to fire the cartridge.

(2) *Back plate trigger action on first shot.*—When the rear end of the trigger, which is pivoted in the center, is pressed down, its forward end pushes up the rear end of the trigger bar; the trigger bar being pivoted in the center acts as a lever and causes the front end to press down upon the top of the sear, forcing the sear down and releasing the sear notch from the shoulder of the firing pin. The firing pin spring forces the firing pin forward to fire the cartridge.

(3) *Backward movement of recoiling parts.*—The explosion of the cartridge forces the barrel to the rear, carrying with it the barrel extension and the bolt which is locked to the barrel extension by the breech lock. When the barrel has recoiled about $\frac{3}{4}$ inch, the breech lock pin strikes the cam surfaces of the breech lock depressors. This unlocks the bolt from the barrel extension and permits the bolt to continue to the rear. As the barrel extension moves to the rear it strikes the accelerator and turns it backward.

(4) *Backward action of accelerator.*—As the accelerator turns backward it strikes the bottom projection on the bolt and accelerates it to the rear. The shoulders on the barrel extension shank engage behind the claws of the accelerator, locking the barrel and barrel extension in a rearmost position to the oil buffer body.

(5) *Backward movement of bolt.*—As the bolt moves backward the driving spring is compressed. The bolt brings with it a cartridge from the belt gripped by the extractor and an empty case from the chamber gripped in the T-slot. The cam lug on the extractor rides along on top of the switch until near the end of the backward movement of the bolt. Then the extractor by action of the cover extractor cam is forced downward until its cam lug is below the switch.

(6) *Action of oil buffer.*—As the barrel and barrel extension move backward together, the oil buffer spring is compressed, since the oil buffer piston rod is linked directly with the barrel extension by means of the hook on the shank projecting from the rear of the barrel extension and the hook on the forward end of the oil buffer piston rod; the oil buffer piston rod head and the oil buffer piston valve are driven rearward in the oil buffer tube forcing the oil through the restricted openings in both the piston rod head and valve. This supplements the action of the oil buffer spring in bringing the heavy recoiling parts to rest without damaging shock or strain on the gun. On the counter-recoil or forward movement of the barrel and barrel extension, the oil in front of the piston rod head will force back the piston valve, uncovering the openings and permitting the oil to pass readily from the forward to the rear side of the piston rod head and valve, thus permitting the rapid return of the parts to the firing position.

(7) *First action of feeding.*—As the bolt moves backward, the stud on the belt feed lever riding in its cam groove in the top of the bolt moves the belt feed pawl laterally into position behind the next cartridge. The ammunition belt is prevented from falling out of the gun by the belt holding pawl.

(8) *Cocking action.*—As the bolt moves backward, the upper end of the cocking lever is forced forward by the top plate bracket attached to the top plate, which brings the lower end of the cocking lever to the rear. When the lower end of the cocking lever moves to the rear it brings with it the firing pin, withdrawing the firing pin from the face of the bolt and compressing the firing pin spring against the sear stop pin. The shoulder of the firing pin engages in the notch in the sear under pressure of the sear spring.

(9) *Action of driving spring.*—When the rear end of the bolt strikes the buffer plate, its remaining force is absorbed in the fiber buffer disks. The driving spring which has been compressed by the backward action of the bolt then forces the bolt forward. On guns manufactured after June 1940, two driving springs, one inside the other and wound in opposite directions, are used. By the use of two springs, greater initial spring load is provided which is an advantage in feeding ammunition

during high angles of fire. The new assembly will be available for replacement of old type assemblies now in service.

(10) *Forward movement of bolt.*—When the bolt starts forward the cam lug on the extractor riding under the switch rotates the extractor downward. This causes the extractor to force the cartridge down the T-slot in line with the chamber. The ejector knocks the empty case from the T-slot and holds the cartridge in line with the chamber. (The empty case may have already fallen out without the action of the ejector.) The upper end of the cocking lever is forced backward and the lower end moves forward away from the rear of the firing pin.

(11) *Release of recoiling parts.*—The lug on the lower rear end of the bolt strikes the accelerator and rotates it forward. This unlocks the barrel extension from the oil buffer body. The barrel extension remains linked with the oil buffer piston rod. (See (6) above.) When the accelerator has been tripped the barrel extension and the barrel move forward, assisted by the oil buffer spring. Part of the forward force of the bolt acts through the accelerator to push the barrel extension forward.

(12) *Loading and locking action.*—The extractor rises as its cam lug moves along the top of the extractor cam and the ejector moves outward, leaving the cartridge in the chamber engaged by the T-slot. The extractor grips the first round in the belt and is held down firmly, ready to extract it, by the cover extractor spring. The breech lock is forced upward by the breech lock cam and locks the breech just before the recoiling parts reach the firing position. (The breech lock engages in a recess cut in the bottom of the bolt and thus locks it firmly to the barrel extension and against the rear end of the barrel.)

(13) *Second action of feeding.*—As the bolt goes forward, the stud on the end of the belt feed lever riding in its cam groove in the top of the bolt moves the belt feed slide and belt feed pawl in a lateral direction. The belt feed pawl carries the first cartridge against the cartridge stops, ready to be gripped by the extractor. The next cartridge is carried over the belt holding pawl, which rises behind it and holds it in position to be engaged by the belt feed pawl on its return movement.

(14) *Trigger action in automatic fire.*—If the hand trigger is held down, the sear is disengaged just before the bolt has reached its forward position, thereby releasing the firing pin. The gun thus fires automatically, repeating the operation of functioning already described. (The release of the firing pin actually takes place when the recoiling parts are still about $\frac{1}{8}$ inch from the forward position but after the breech is locked.) When the firing lever of the M2

mount is depressed, the trigger control mechanism acts through the side plate trigger and the sear slide in the bolt to disengage the sear from the firing pin, thereby igniting the cartridge. The reaction from firing causes the gun to recoil in the cradle. During counterrecoil the lug on the side plate trigger engages the mating lug of the trigger control, the sear is disengaged, and another cartridge is ignited. During this cycle the gun is fired semiautomatically.

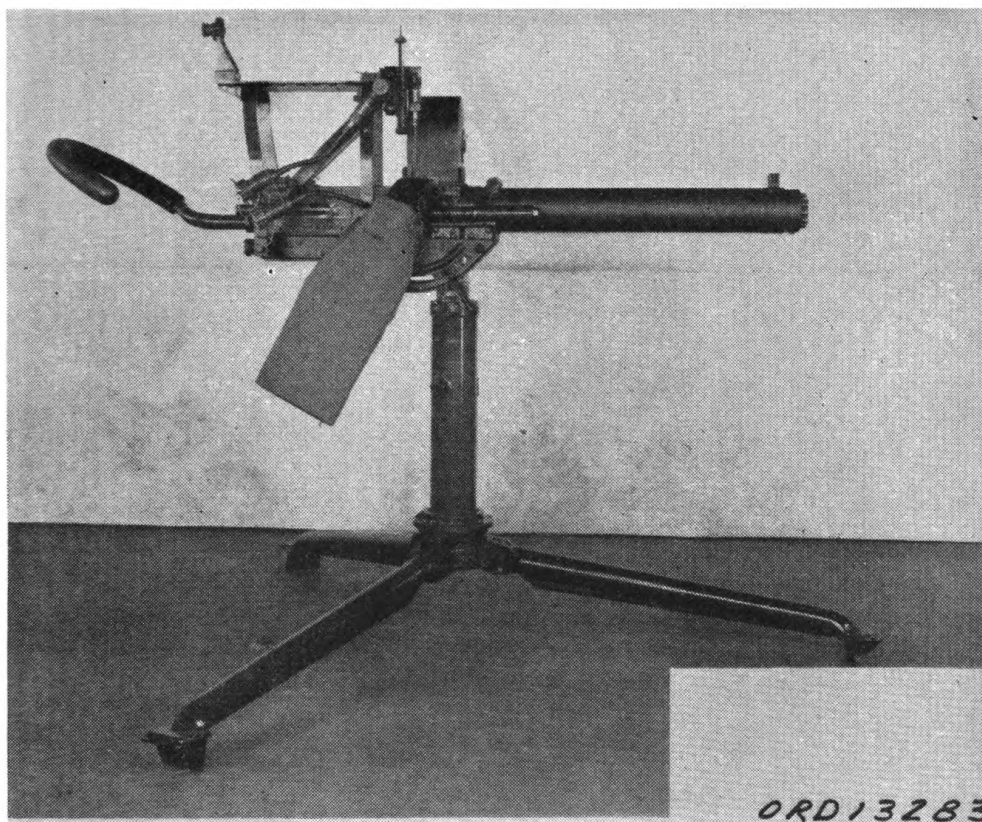


FIGURE 3.—Antiaircraft machine-gun mount, caliber .50, M2, zero elevation.

7. Description of anti-aircraft machine-gun mount, caliber .50, M2.—*a.* The anti-aircraft machine-gun mount, caliber .50, M2 is normally assembled with tripod legs as shown in figures 3, 4, and 5. By removing the tripod legs and assembling a pedestal base the mount may be mounted on decks or other permanent positions. When assembled with tripod legs the mount is designated as anti-aircraft machine-gun tripod mount, caliber .50, M2, and when assembled with pedestal base is designated as anti-aircraft machine-gun pedestal mount, caliber .50, M2. Except for the pedestal base the pedestal mount is identical with the tripod mount described herein.

b. The antiaircraft machine-gun tripod mount, caliber .50, M2 (fig. 5) consists principally of the pedestal (4), tripod legs (5), cradle (2), pintle (3), back rest (6), sight support (7), and the rear sight (8), and front right (26) assemblies. The lever of the trigger control mechanism is indicated at (27) and a safety lock at (29).

(1) *Tripod* (fig. 5).—The tripod is composed of the pedestal and the tripod legs.

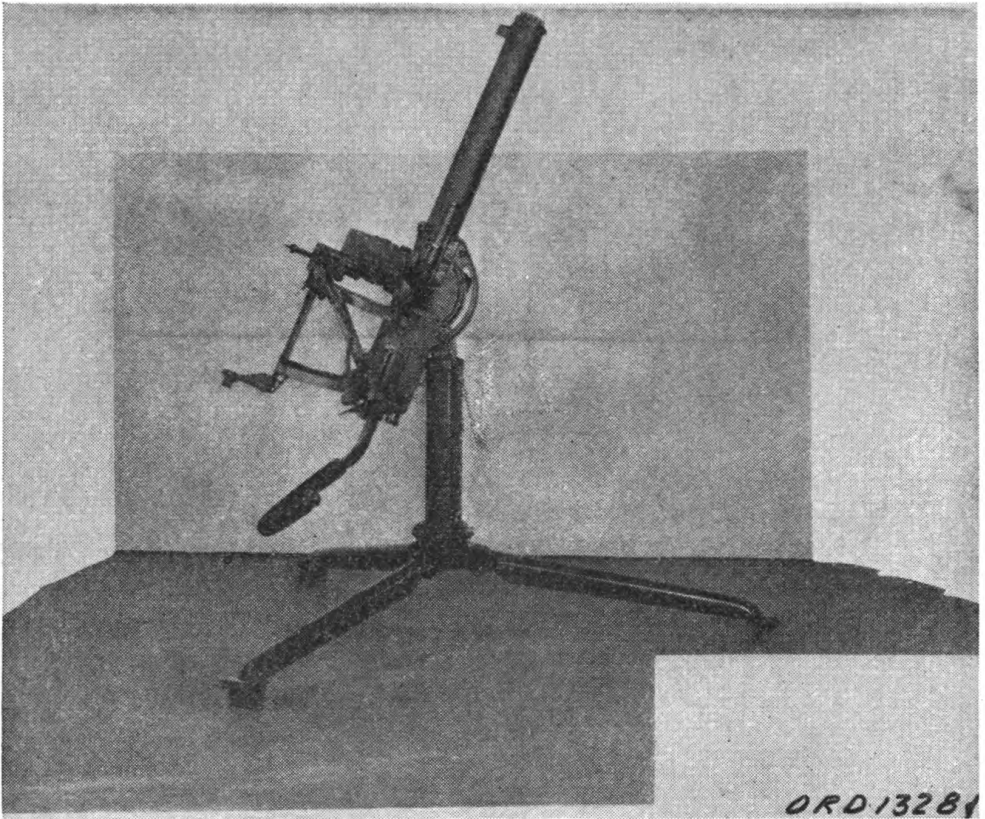


FIGURE 4.—Antiaircraft machine-gun mount, caliber .50, M2, maximum elevation.

(a) *Pedestal.*

1. The pedestal is a seamless steel tubing body lined with bronze bushing (9) (forced in place) which forms the seat for the cradle pintle. The lower portion of the pedestal is assembled with the pedestal base support ring (10) welded in place. The ring (10) is threaded to fit the removable hook (11) provided to hold down and stabilize the tripod on a hard base or in a truck. The pedestal is designed to be mounted on a pedestal

base assembly in certain applications in which the tripod legs are not used, such as deck mounts for Army mine planters.

2. The base ring (12) welded to the pedestal body forms the connection of the pedestal with the tripod legs. The leg clamping ring (13) is threaded to fit the base ring and is used to lock the tripod legs in firing position. Tapered ring (14) of the clamping ring assembly engages a mating lug (21) on head (17) of each tripod leg, drawing the latter into place when the clamping ring is screwed down.

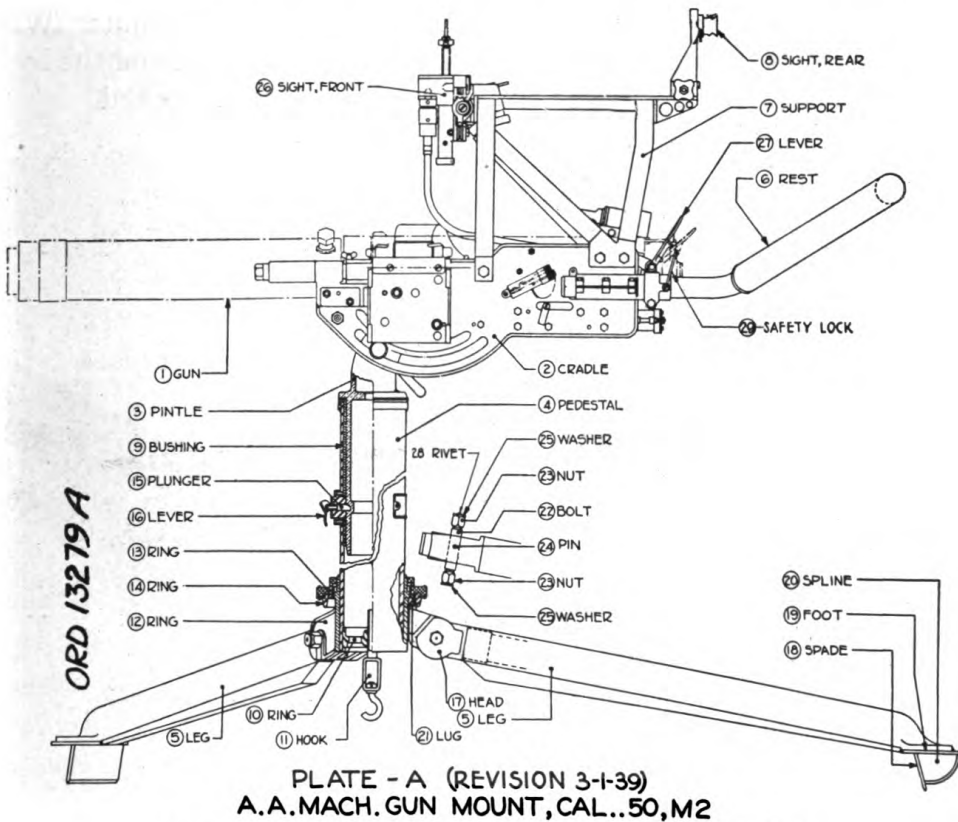
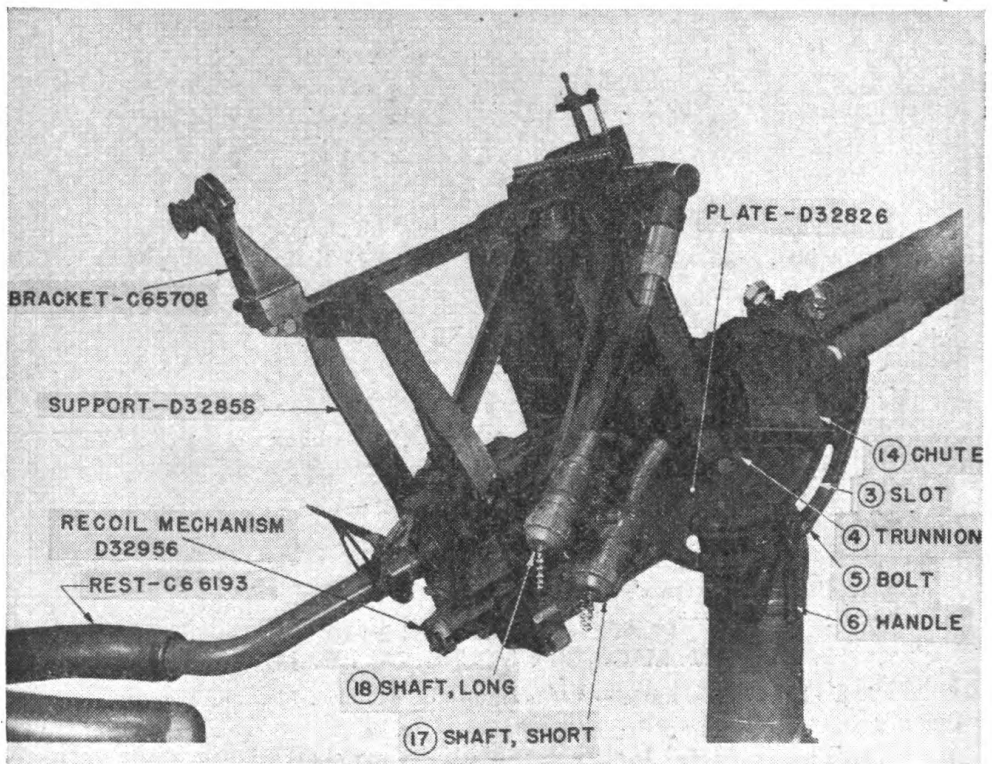


FIGURE 5.—Antiaircraft machine-gun mount, caliber .50, M2.

3. The pedestal lock assembly is composed of a spring actuated plunger (15) which engages a mating groove in the pintle and retains the latter in firing position. Cam lever (16) withdraws the plunger when the lever is placed in horizontal position, thereby permitting removal of the pintle from the pedestal.

(b) *Tripod legs.*

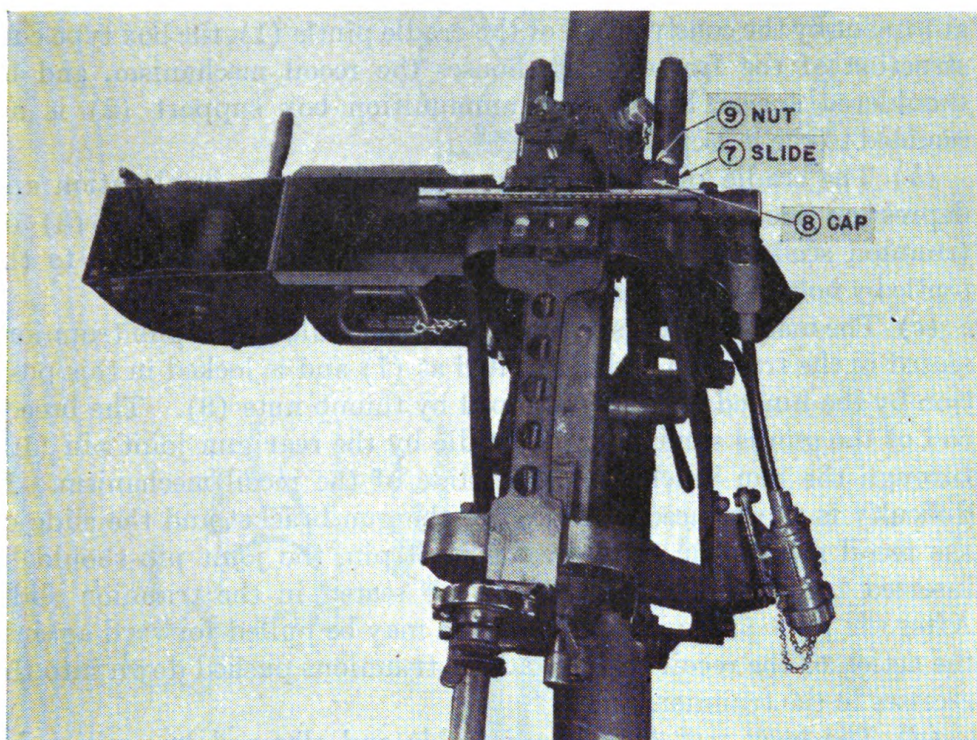
1. The tripod legs are seamless steel tubing reinforced on the bottom, fitted on the upper end with head (17) and flattened on the lower end to assemble the spade (18), foot (19), and spline (20).
2. The bolt (22) is designed to fasten the tripod leg to the base ring. The body of the bolt is machined on both sides of the head to fit mating slots in the base ring. The ends of the slots are countersunk spherically to seat a spherical surface chamfer on the nuts (23). The taper pin (24) locks the bolt to the tripod head. Washers (25) with rivet (28) are provided to prevent the loss of the nuts. With the nuts engaged in their countersunk seats and the locking ring screwed down, the tripod legs are locked.



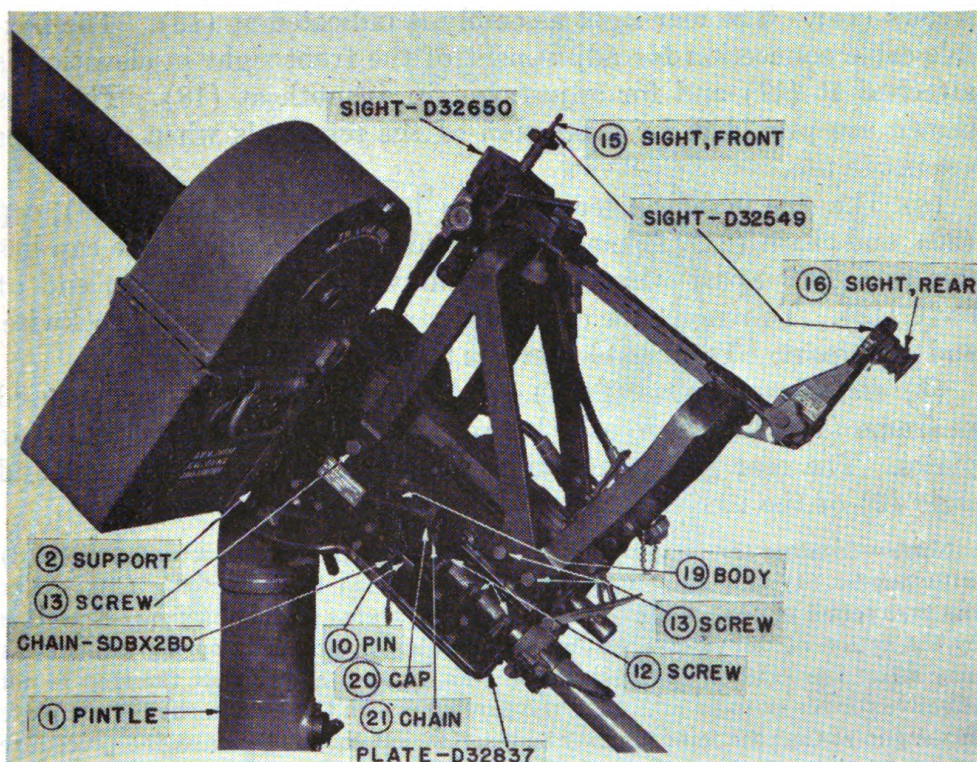
① Right side view.

FIGURE 6.—Antiaircraft machine-gun mount, caliber .50, M2, cradle assembly.

(2) *Cradle* (fig. 6).—(a) The cradle is the basic design adopted for machine-gun mounts and is composed of right and left side plates, flanged and embossed to obtain maximum rigidity with minimum weight. The plates are assembled into a rigid unit and are kept in



② Top view.



③ Left side view.

alinement by the construction of the cradle pintle (1), the box type construction of the frame which houses the recoil mechanism, and by shouldered spacer bolts. The ammunition box support (2) is assembled to the left cradle plate.

(b) The cradle pivots for movement of the gun in elevation and depression are controlled by the length of the cradle slots (3) on trunnion studs (4) mounted on the pintle, and are clamped to the pintle by bolt (5) with cradle clamping handle (6).

(c) The machine gun is assembled to the cradle by the gun trunnions seated in the trunnion slide indicated at (7) and is locked in this position by the hinged caps (8) clamped by thumb nuts (9). The breech end of the gun is secured to the cradle by the rear gun joint pin (10) through the gun bracket and the slide of the recoil mechanism. If difficulty is experienced in lining up the gun bracket and the slide of the recoil mechanism to insert the joint pin, the joint pin should be inserted before the gun trunnions are seated in the trunnion slide. After the joint pin is inserted, the gun may be pulled forward against the action of the recoil spring and the trunnions pushed down into the recesses in the trunnion slide.

(d) The back rest (11) is adjustable and clamped in position by cap screws (12). The sight support is bolted to the cradle by cap screws (13). The rear sight assembly is indicated at (16). The flexible cable connection for adjustment of the front sight in elevation is attached at (17) and for adjustment in azimuth at (18). The caps shown are provided for protection of the terminals when the cables are not in use.

(e) The side plate trigger container is composed of body (19), cap (20), and chain (21), fastened to left side of the cradle. The cap has two pins 180° apart which mate with two slots in the open end of body (19). To remove the cap, press cap (20), turn counterclockwise, and pull apart. To assemble, reverse the above order.

(3) *Recoil mechanism* (fig. 7).—(a) The recoil mechanism is housed in frame (1) which is located between and secured to the cradle side plates. The rear gun joint pin passes through the gun bracket and slide (2) of the mechanism.

NOTE.—To aline the slide with the gun bracket, the spring actuated stop (3) with handle (4) and shaft (33) must be positioned to contact lug (5). After the first round is fired, the stop automatically returns to the disengaged position by the action of the torsion spring (6). Slight variations in spring adjustment may affect the location of the trunnion slide in such a way that the stop is not effective for the purpose of alining the gun slide with the hole in the bottom plate of the gun so that the joint pin may be inserted. If such is the case, the procedure outlined in (2) (c) above should be followed.

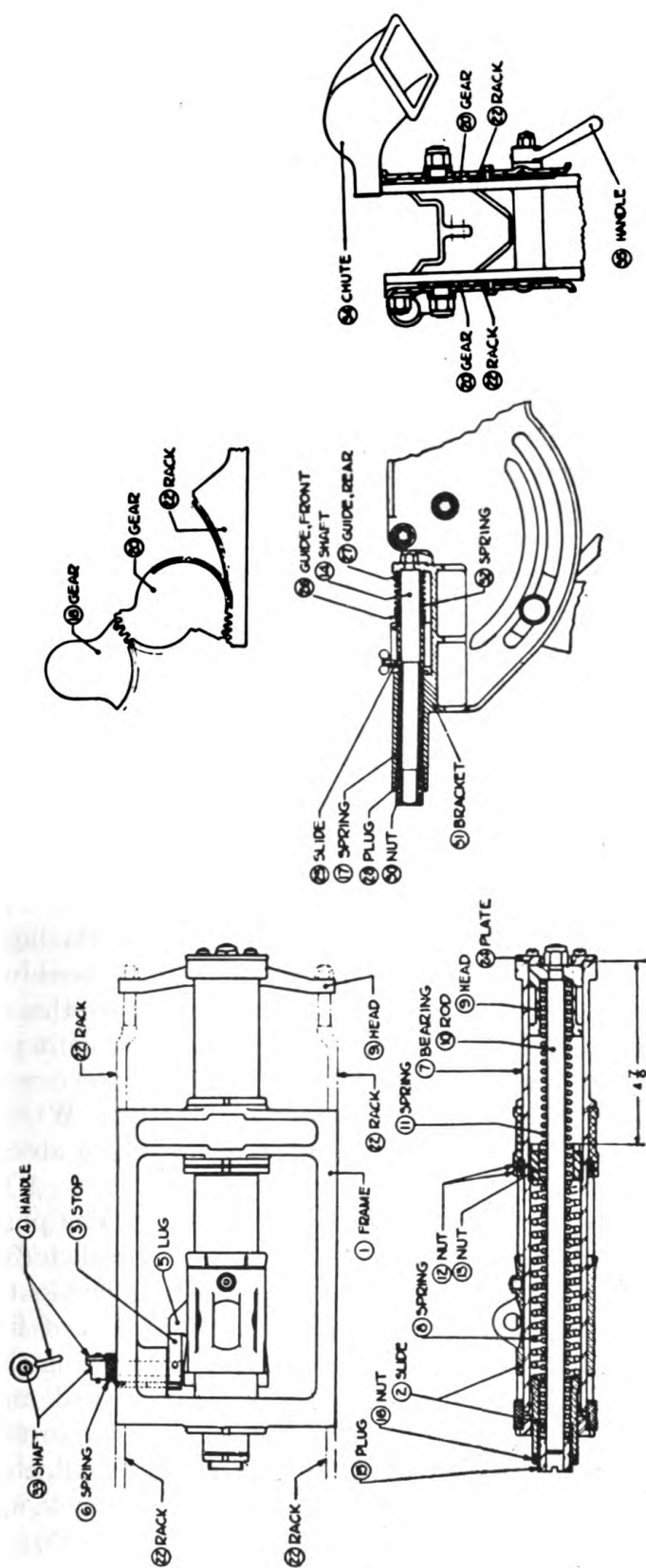


FIGURE 7.—Antiaircraft machine-gun mount, caliber .50, M2, recoil mechanism.

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(b) The lower recoil mechanism assembly is composed of bearing (7) secured to the frame by nuts (12) and machined to allow a slide fit for slide (2). The bearing houses the recoil spring (8) in addition to head (9), which mounts rod (10) provided to guide the component spring (11). The spring (11) compensates for the component weight of the machine gun between zero and maximum elevation.

(c) The recoil spring (8) is retained between the slide (2) and nut (13). The component spring (11) is seated between head (9) and threaded plug (15). The plug is provided for adjusting the tension of the spring and is locked by nut (16).

(d) The two upper recoil springs (32) are assembled on shaft (14) to the rear of the slide (25) which carries the trunnion bearing. Front guide (26) is placed in front of spring (32) and the rear guide (27) at the rear of the spring (32).

NOTE.—These springs do not require any adjustment. The guides must be lubricated.

(4) *Operation of recoil mechanism* (fig. 7).—As the machine gun recoils, slide (2) moves with the gun to the rear, compressing springs (8), (11), and (32). The built-up spring pressure brings the gun to rest at the end of recoil and returns it to battery during counter-recoil. The counterrecoil of the gun is retarded by the counterrecoil springs (17). The firing mechanism is so arranged that the gun cannot be fired until it reaches a predetermined point in the path of counterrecoil, which is determined by the location of the lug which contacts the side plate trigger. Whether the gun is fired when it reaches this point or later depends on the relation of the moving parts of the gun mechanism, that is, the sear slide must be in position to be disengaged by the side plate trigger. The counterrecoil force of the gun is finally checked by the impulse of this shot. When firing a single shot and on the last shot, the counterrecoil spring absorbs the final energy of counterrecoil.

(5) *Adjustment of recoil mechanism* (fig. 7).—(a) The plug (28) should be $6\frac{1}{8}$ inches from the forward rear face of bracket (31) and lock nut (30) locked against it. Screwing in the plug checks the gun earlier in counterrecoil and will disturb the smoothness of firing if screwed in more than a few turns (clockwise). Unscrewing the plug (counterclockwise) reduces the counterrecoil spring load and aids smoothness of action. However, caution is necessary due to unavoidable variation in energy of cartridge, friction in links, pull, etc. The gun must not be allowed to come in battery, metal to metal with the forward rear face of bracket (31) and the front of slide (25).

(b) The constant recoil is obtained by the compensating spring which is acting on three planetary gears and racks. Gear (18) is secured to the cradle pintle and meshes into gear (20) which pivots on the cradle and meshes into rack (22).

(c) The mechanism is adjusted for normal recoil of the machine gun at zero elevation. As the gun is elevated, gears (20) rotate on gears (18) and pull racks (22) attached to head (9) forward. This movement compresses the compensating spring and maintains normal recoil.

(d) During depression of the machine gun from zero elevation, no change takes place in the spring adjustment, and the movement of the gears and racks is compensated by the extended turned surface (9) in the space between the nut and shoulder of the rack.

(e) *To adjust lower recoil spring (8).*—Remove nuts on racks (22), plate (24), head (9), rod (10), and spring (11). The normal adjustment of recoil spring (8) is made by setting the rear of nut (13) $4\frac{7}{8}$ inches from the rear end of bearing (7). Make sure the measurement is taken from the rear of the nut (13) and *not* from the bottom of the wrench slot which is $\frac{3}{8}$ inch deep. Each complete clockwise turn of nut (13) increases the compression of the spring approximately $3\frac{1}{2}$ pounds. Assemble spring (11), head (9), rod (10), plate (24), and the nuts on the racks (22).

Caution.—Do not place nut (13) closer to the end of the recoil spring housing than $4\frac{7}{8}$ inches (normal setting). This prevents a metal to metal contact at maximum elevation. This setting gives full adjustment forward for the spring reserve. This spring has a stress below 60,000 pounds per square inch and should require little if any adjustment. The spring must be cleaned occasionally and, unless plated, must be covered with a light grease to prevent corrosion.

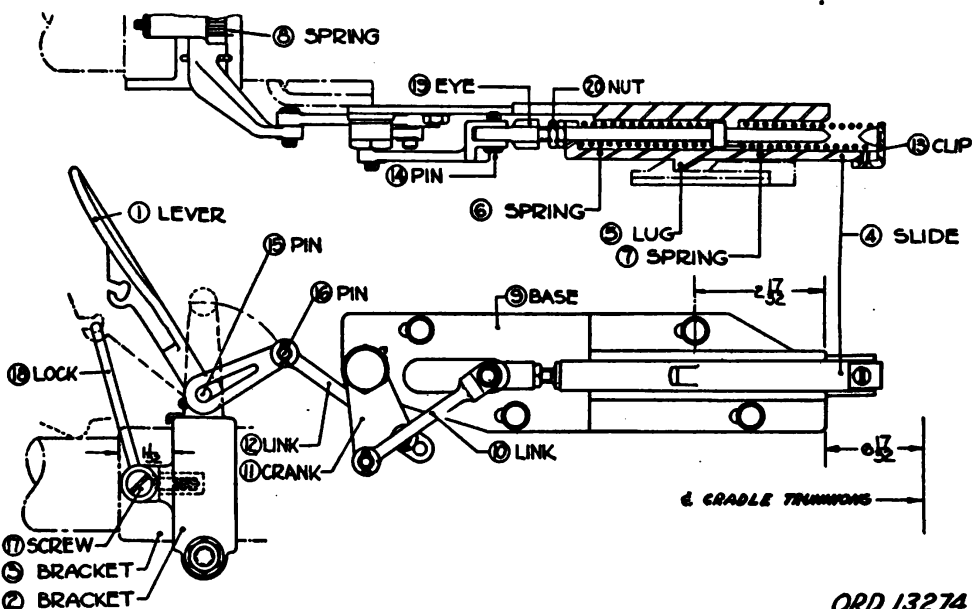
(f) *To adjust component spring (11).*—The plug (15) should be flush with lock nut (16). The latter must be tightened and be secured by the lockwasher bent slightly into the wrench slot. No further adjustment is required normally.

(g) Lubricate slides (2) and (25) frequently through the oil hole provided in the top of the slide with a light lubricating oil, Navy contract No. 2110 (equivalent to SAE 10, 90–120 viscosity at 130° F.).

(h) Match marks are provided for correct assembly of gears (18) and (20) and proper caution must be exercised when removing the springs in order to avoid possible injury to personnel.

(6) *Trigger control mechanism* (fig. 8).—This mechanism is shown in the disengaged position.

(a) Lever (1) is mounted on the bracket (2) which clamps to the back rest bracket indicated at (3). When firing, lever (1) is pushed down to rest on the back rest. In this position, slide (4) is pulled to the rear and with it, by contact with lug (5), the side plate trigger slide on the machine gun which operates the firing mechanism of the weapon. Coil spring (6) is provided to absorb the trigger firing load during automatic firing, which would otherwise be transmitted to the lever. It also provides a yieldable connection to fire the first shot and then timed automatic firing. Coil spring (7) in addition to the torsion spring (8) will return the mechanism to disengaged position when the lever is released, and return the side plate trigger slide to the neutral position.



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FIGURE 8.—Antiaircraft machine-gun mount, caliber .50, M2, trigger control mechanism.

(b) The rear of the hand trigger bracket (2) should be set $1\frac{1}{2}$ inches from the rear of the back rest bracket (3) also shown on figure 9. This setting should not be changed more than $\frac{1}{8}$ inch to front or rear. The trigger side plate is located by matching the index lines on the slide, C66237, and side plate, D32837. This setting also should be within $\frac{1}{8}$ inch. Incorrect setting of either the bracket (2) or slide, C66237, places unnecessary load on spring (6) and side plate trigger lever spring (8), as well as on the linkage (fig. 8). To move bracket (2) forward loses some of the preferable throw. Move the bracket the same amount as slide, C66237, (fig. 9) if the adjustment is changed.

(c) Safety lock (18) (fig. 8) is provided to lock the firing mechanism and is shown with the firing mechanism in the "safe" position. To fire, pull down the safety lock.

(7) *Sight assemblies* (fig. 10).—(a) *Rear sight*.

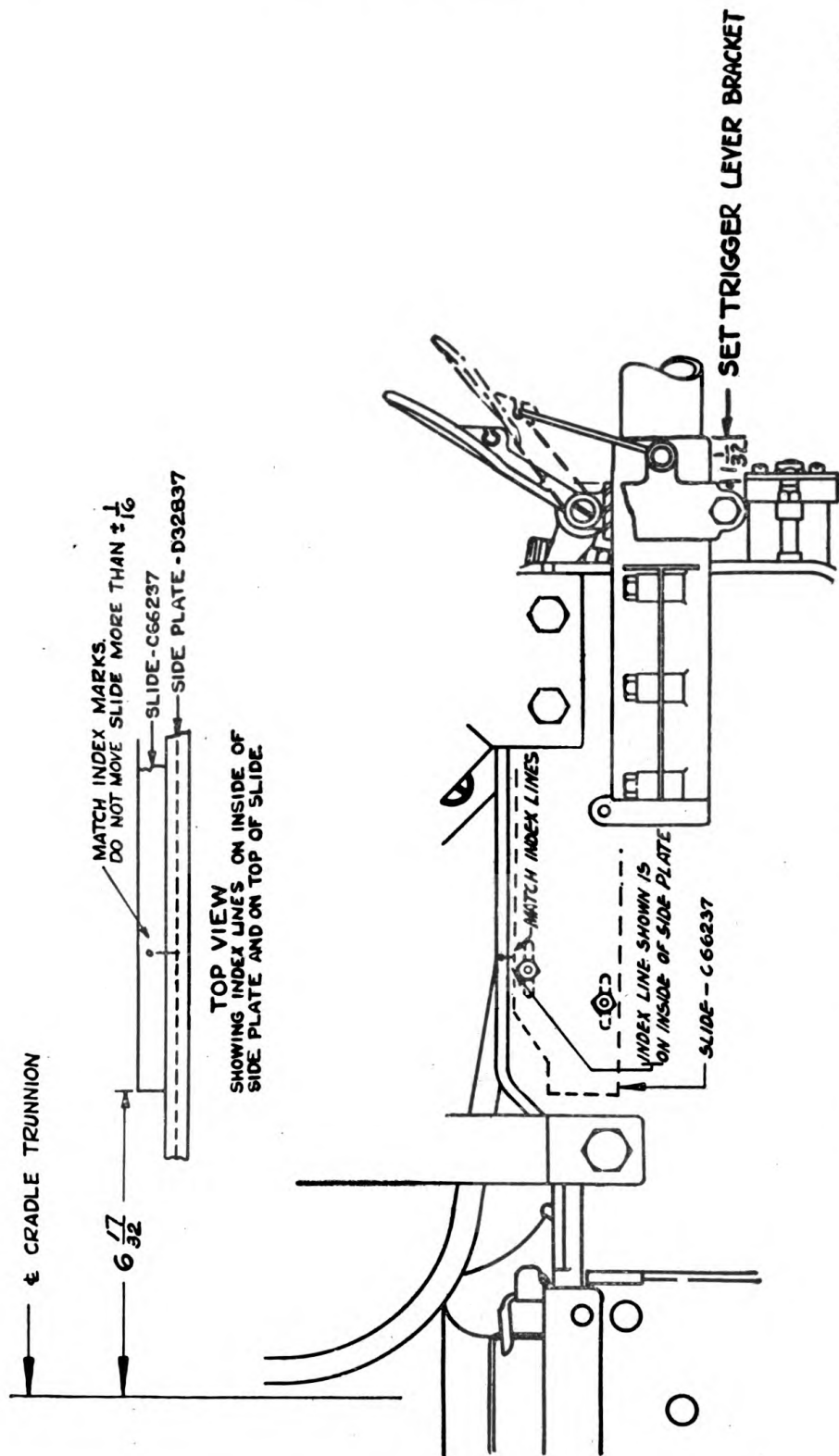
1. The rear sight is mounted on bracket (4) which is secured in clamp (20) of the sight support. The bracket is provided with hinged cap (3), secured by the spring actuated pin (5) engaging a mating detent. To open the cap, pull down on knob (6). Pin (7) is provided for locating the rear sight assembly on the bracket.
2. The body (15) of the rear sight mounts on the rotatable disk (16), provided with $\frac{5}{16}$, $\frac{1}{4}$, $\frac{3}{16}$, and $\frac{1}{8}$ inch peepholes, which can each be brought in line with the front sight. Each adjustment is secured in position by the spring actuated pin (17) engaging a slot cut in the periphery of the disk. A slight vertical and horizontal adjustment is provided by means of an adapter. Adjustment of the adapter is obtained by removing three screws (18) which fasten the adapter (with shield) to the body, and repositioning the adapter in relation to the body (15) and inserting the screws. The front sight (19) is mounted on the elevating screw of the front sight assembly.

(b) *Front sight* (fig. 11).

1. The front sight is automatically adjusted from an off-carriage control station by means of flexible shaft cables connected with the front sight mechanism for elevation and for traverse. The flexible shaft cables are equipped with male couplings on the drive shaft, engaging female couplings on the casings. For further description of the off-carriage control, see section VI.

NOTE.—The metallic casing has a tendency to shrink under ordinary usage due to flexing in handling, causing the shaft to become longer than the casing and, if forced back into the casing by the coupling, tends to buckle and increase friction. Caution should be taken against unnecessary handling. Sliding connections are provided for the drive shaft couplings.

2. The aluminum front sight track body (3) with steel insert (4) is mounted on the sight support (5) with the steel insert on the body engaging the dovetailed front sight socket (6). The body is located by locking bolts (7) engaging mating holes in the body and is secured by plate (8) drawn down by threaded knobs (9).



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FIGURE 9.—Antiaircraft machine-gun mount, caliber .50, M2, trigger adjustments.

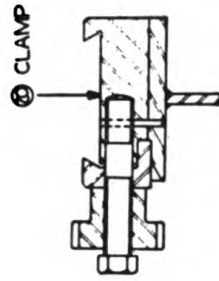
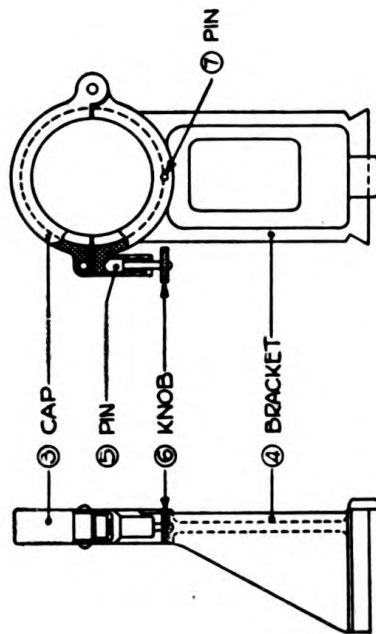
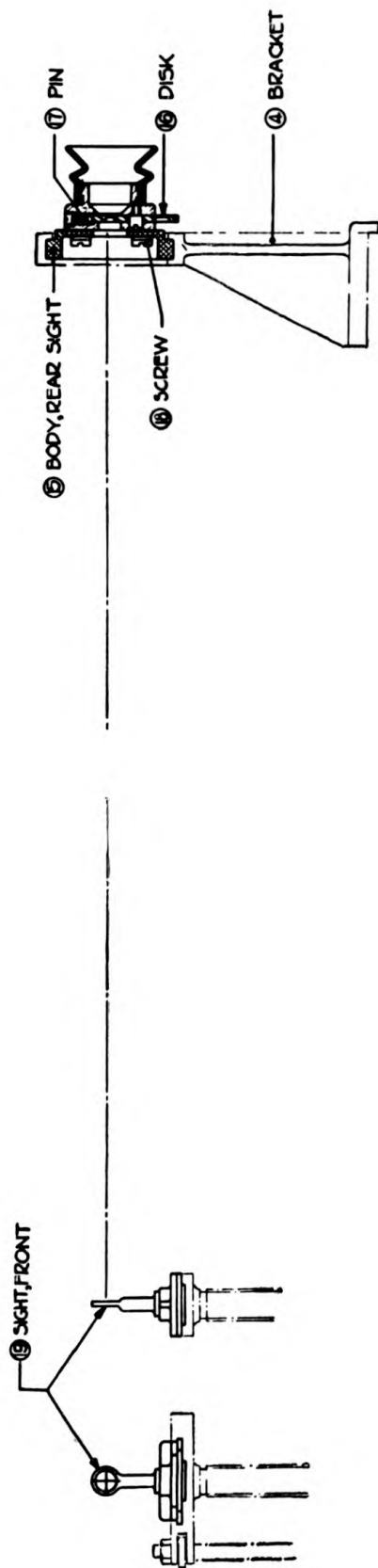
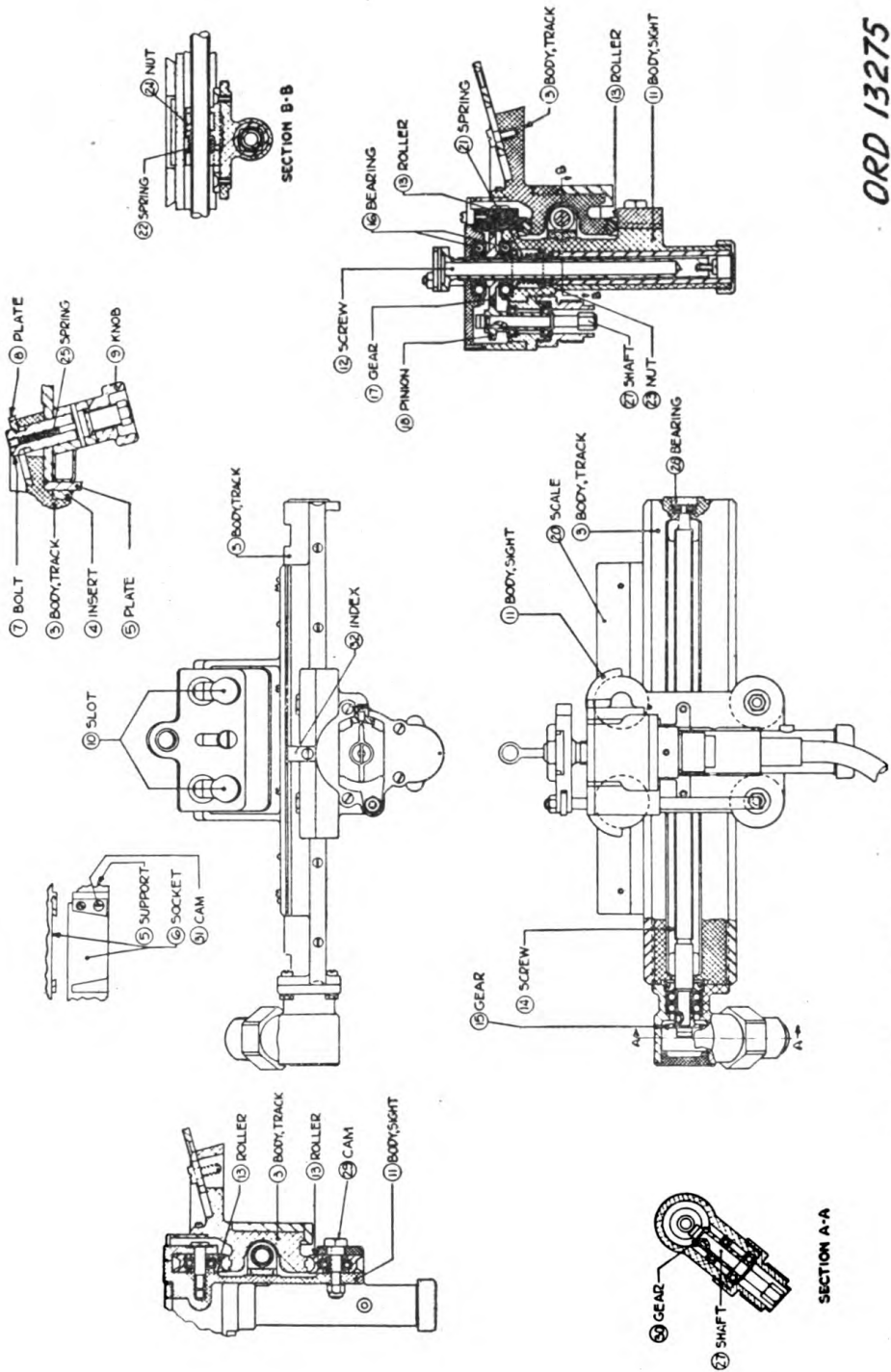


FIGURE 10.—Antiaircraft machine-gun mount, caliber .50, M2, sight assemblies.

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FIGURE 11.—Antiaircraft machine-gun mount, caliber .50, M2, front sight mechanism.

3. Plate (8) is provided with elongated slots (10) on one end, with a countersunk seat on the other end to seat the heads of bolts (7).
4. When removing the front sight mechanism, release knobs (9). This causes the spring actuated bolts to rise and release the plate. Push the plate in position so the body holes will permit raising the body off the bolts and out of the dovetail.
5. The front sight body (11) houses the front sight elevating screw (12) and moves in traverse on the front sight track body (3) on steel insert rollers (13). Traverse is by means of the ball bearing mounted traversing screw (14) driven by the flexible cable through a bevel gear drive (15). Index (32) travels along horizontal scale (20).
6. The front sight elevating screw (12) is mounted on ball bearings (16) and is raised and lowered by the internally threaded gear (17) driven by pinion (18) which in turn is driven by the flexible cable from the off-carriage station. The head of the elevating screw is flattened on both sides and machined with an undercut to seat the front sight. Attached to the elevating screw is an adjustable scale.
7. To assemble the sight to the elevating screw, place the sight with the flat at right angles to the flat on the screw head and turn the sight 90° in the undercut until the spring actuated plunger in the elevating screw head engages a mating detent in the sight.

NOTE.—Each graduation on the elevating scale and the traversing scale indicates a 1-mil change in elevation or traverse respectively of the machine gun.

c. When converting the tripod mount into a pedestal mount, the tripod legs are removed and the pedestal is mounted on the pedestal base. The pedestal base is located by the projection on the base fitting the mating recess on the pedestal base support ring and is secured to the pedestal by three eyebolts. The pedestal base is threaded left hand in three places. These three places contain sleeve nuts in which the eyebolts are assembled. These eyebolts fit into the lugs from which the tripod legs were removed. Bolts inserted through the lugs and eyes of the eyebolts complete the assembly. The pedestal is firmly secured to the pedestal base by turning the sleeve nut to tighten the eyebolts. The eyebolts should be tightened uniformly to assure accurate seating of the pedestal in the pedestal base.

8. Description of antiaircraft machine-gun tripod mount, M1 (fig. 12).—The mount is of the tripod type in which the cradle and yoke are supported on a center support so that the gun can be freely moved by hand in azimuth through 360°. All positions of elevation are allowed from approximately 10° depression to 80° elevation.

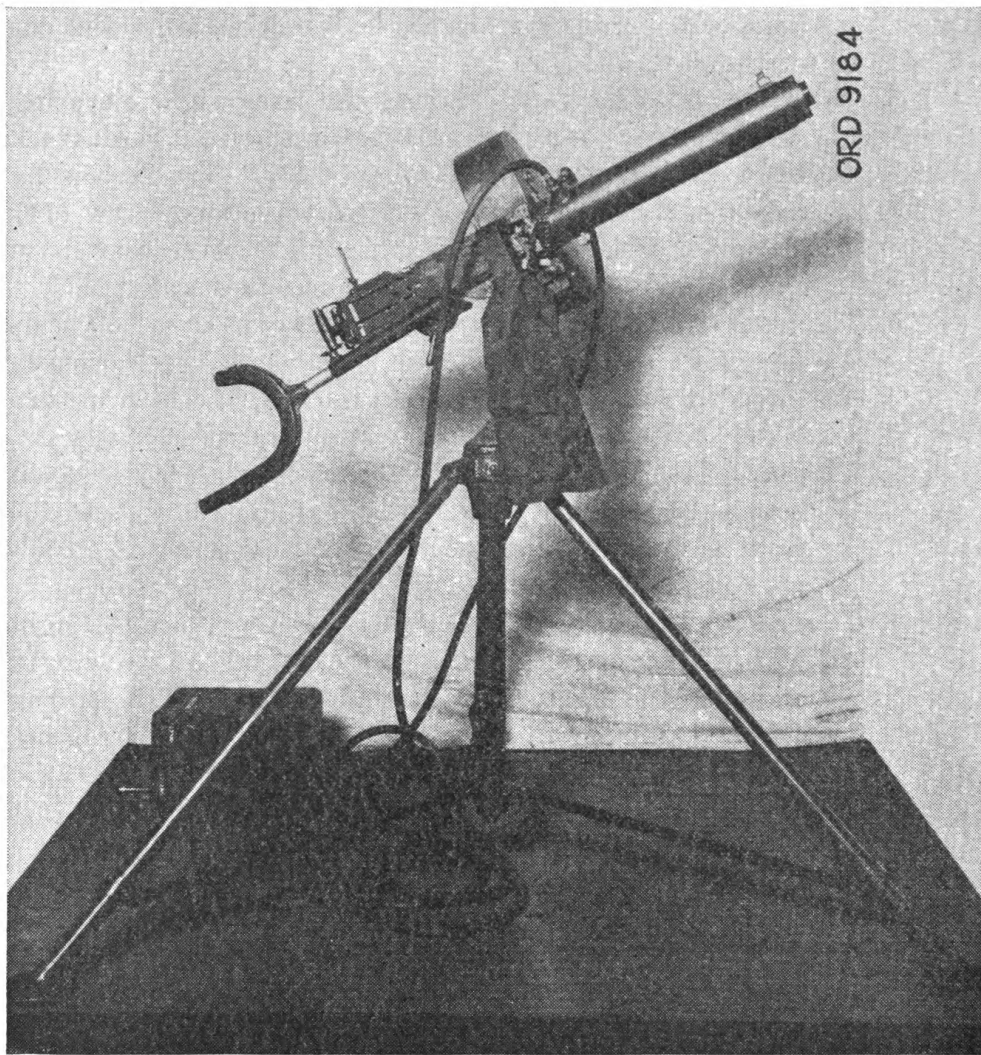


FIGURE 12.—Antiaircraft machine-gun tripod mount, M1.

A shoulder stock known as the shoulder stock, M2, is considered a part of the tripod mount and is provided for the purpose of assisting the gunner in steadying the gun in antiaircraft fire. When the locking handle is unscrewed a part turn, the adjusting bracket is free to slide on the center support, permitting the tripod legs and lower braces to be folded.

SECTION II

DISASSEMBLY, ASSEMBLY, AND HEAD SPACE

	Paragraph
General	9
Removal of groups from gun	10
Replacing groups in gun	11
Head space	12
Disassembling	13
Assembling	14
Packing barrel	15
Changing barrels	16

9. General.—*a.* The following disassembling is the only disassembling authorized for using troops for the care, cleaning, and replacing of parts.

b. In removing springs caution should be exercised to avoid injury to personnel and damage to parts. When loosening parts which hold springs under tension keep personnel not directly engaged in the operation clear of the path the suddenly released spring might take.

10. Removal of groups from gun.—*a. Cover.*—Release cover latch and open cover. The cover need not be removed as the other parts of the gun may be taken out without removing it.

NOTE.—Removal of the cover group is not recommended unless necessary for repair as it is difficult to reassemble due to the force required to compress the detent pawl spring.

b. Back plate.—Release back plate latch lock and back plate latch and lift out back plate.

c. Bolt group.—Press forward and away from the side plate on end of driving spring rod to release the retaining pin in head of rod from the hole in the side plate. Remove driving spring rod. Draw bolt to the rear until the bolt stud is in line with the hole in center of slot in the side plate. Remove bolt stud from bolt. Remove the bolt, complete, out of the rear end of the gun casing.

d. Oil buffer.—Compress oil buffer body spring lock, using a cartridge point or a drift through the hole in the right hand side plate. Remove oil buffer, barrel extension, and barrel assembly by pulling out to the rear. Detach oil buffer assembly from barrel extension by pressing the accelerator forward.

11. Replacing groups in gun.—*a.* Hold barrel and barrel extension in the left hand and oil buffer assembly in the right hand. With the index finger holding the accelerator up under the barrel extension shank, start the breech block depressors into the guideways in the barrel extension and press forward, allowing the shank of barrel

extension to engage in the cross groove of the piston rod. Push forward as far as the oil buffer will go, having the accelerator back as far as possible. This will lock these components together so that the barrel, barrel extension, and oil buffer assembly may be placed in the casing of the gun as a unit. Push this unit forward in the casing until the lock of the oil buffer seats in the recess in the side plate.

b. Press cocking lever forward in bolt and insert bolt into the casing. Push bolt forward until the hole for the bolt stud is in line with the enlarged opening in center of slot in the side plate. Insert bolt stud in bolt, being sure that the collar on the bolt stud is inside the side plate. Push bolt completely forward guiding the extractor from the front with the fingers to prevent it from catching.

c. Insert driving spring rod assembly into the hole in bolt. Engage driving spring rod retaining pin in its seat in the right hand side plate.

d. Replace back plate. When replacing the back plate make sure the latch lock is in the unlocked position until the back plate is latched.

e. Close and latch cover.

12. Head space.—The head space of a military weapon with a cartridge fully seated in the chamber is the distance between the base of the cartridge and the face of the bolt. In Browning machine guns, the head space is adjusted by obtaining the proper distance between the forward part of the bolt and the rear end of the barrel. The head space adjustment must be checked before firing.

a. Head space adjustment.—(1) In the past the head space has been adjusted with the barrel, barrel extension, and bolt out of the gun. However, the best adjustment is obtained with the gun fully assembled. This method has the additional advantage of avoiding the loss of the cooling liquid.

(2) To adjust the head space with the gun assembled, screw barrel into barrel extension, using the point of a cartridge until the action will just close without being forced. Then unscrew the barrel *two* notches.

Caution.—Care must be exercised to avoid roughening the barrel surface during adjustment. Care must also be exercised to eliminate binding of the barrel by the packing, or a false adjustment may otherwise be obtained.

b. Effect of head space adjustment.—Probably the most important adjustment of the machine gun is the head space adjustment. Tests show that shot patterns are not adversely affected by the head space when the guns are adjusted as outlined above. In fact, better uniformity of shot patterns will be obtained when the guns are operated

with the above adjustment which is based on the fundamental design of the weapon. Tests have also proved that guns may be damaged and in some cases put out of action by using unapproved methods of adjusting the head space. Many reports show that difficulties with improperly guided belts and with firing mechanisms have been attributed to undue concern over head space adjustment.

(1) *Insufficient head space.*—When the head space adjustment is too tight, poor functioning will result as the breech lock will not fully enter its recess in the bolt. This condition may damage the barrel extension, bolt, or breech lock. Extraction trouble may also occur due to improper timing of locking and unlocking. Furthermore, with a tight head space adjustment the gun operates sluggishly because of the binding of the moving parts.

(2) *Excessive head space.*—If the head space is too great, a separation of the cartridge case may occur. Should there be any weakness in the base of the cartridge case, such as a split case, the possibility of a rupture is increased by excessive head space.

13. Disassembling.—*a. Bolt group* (fig. 13).—(1) Remove bolt group from gun.

(2) Remove extractor by rotating upward and pulling out from bolt. The ejector and ejector spring can be removed after driving out the ejector pin.

(3) Lift bolt switch off bolt switch stud.

(4) Rotate cocking lever fully backward and release firing pin by pushing down the sear. Remove cocking lever pin and cocking lever.

(5) With thin end of cocking lever swing the sear stop out of its groove in the bolt into the center of slot in the bolt; then turn bolt over and push sear stop out of engagement with firing pin spring. Reverse bolt and remove sear stop from slot.

(6) Depress sear and remove sear slide. Pull out sear and sear spring.

(7) By holding the bolt with front end slightly elevated the firing pin extension and firing pin will drop out. The firing pin spring can be removed from the firing pin extension by driving out the firing pin spring stop pin. Take precautions to prevent firing pin spring from flying out during the operation. This should not be done unless it is necessary to replace the firing pin spring.

(8) The driving spring and driving spring rod collar can be removed from the driving spring rod assembly by driving out the driving spring rod collar stop pin from the driving spring rod. This should not be done unless it is necessary to replace the driving spring.

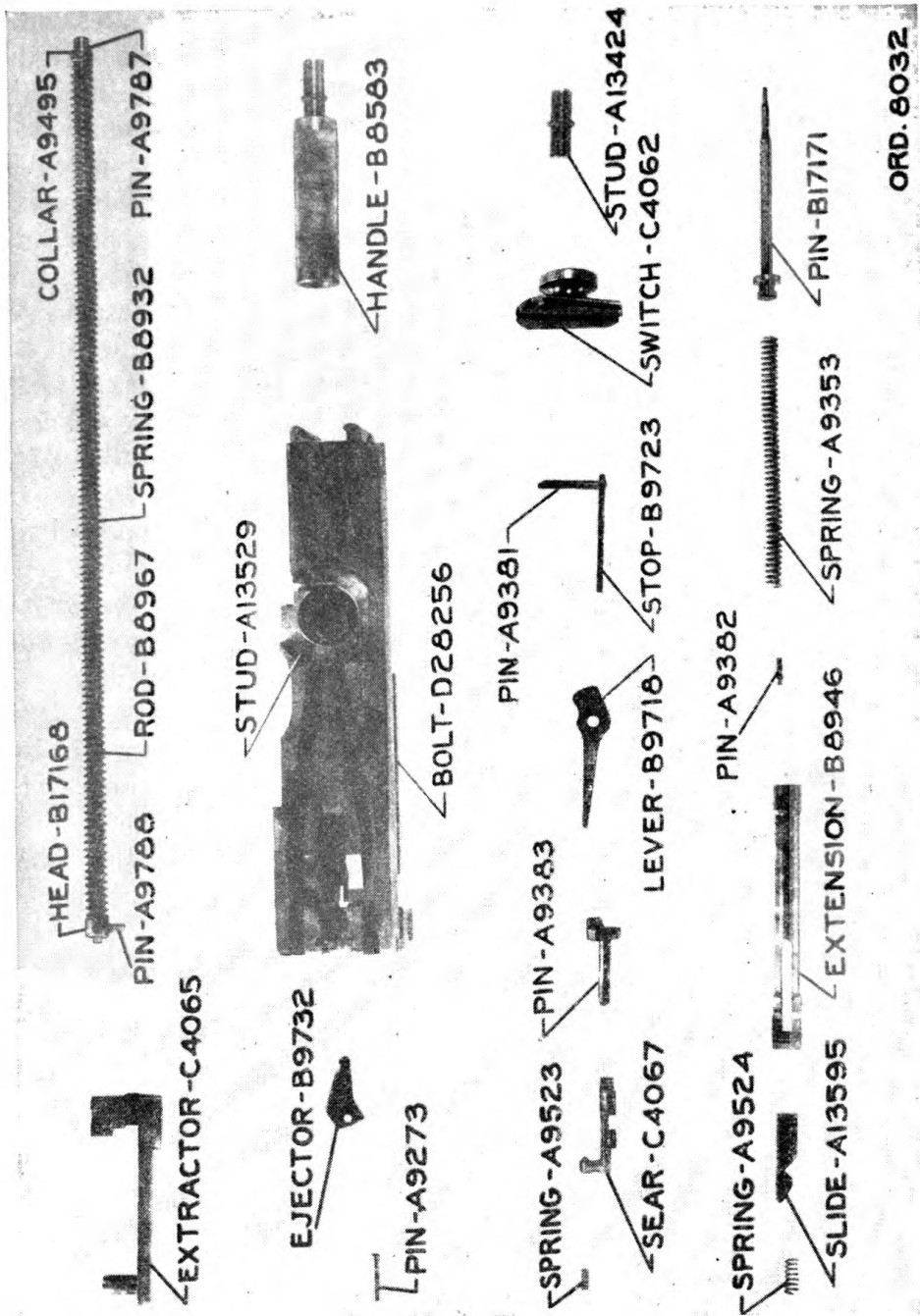


FIGURE 13.—Bolt group.

b. Oil buffer group (fig. 14).—(1) Remove oil buffer, barrel extension, and barrel assembly from gun. Detach oil buffer from barrel extension by pressing accelerator forward.

(2) Remove oil buffer body spring lock by pulling it to the rear.

(3) Hold oil buffer body, bottom up, in the left hand with the index finger between depressors and prongs of accelerator. With the point of a cartridge press the stud on the end of the oil buffer tube lock spring to disengage it from its hole in the oil buffer tube body. At the same time raise accelerator upward and rotate to the rear. Remove oil buffer tube lock spring.

(4) Drive out accelerator pin and remove accelerator.

(5) The oil buffer tube assembly should not be disassembled unless absolutely necessary to replace the oil buffer spring. To disassemble, depress oil buffer spring guide sufficiently to clear oil buffer piston rod pin; turn oil buffer spring guide until oil buffer piston rod pin will pass through slots in the guide. Remove guide and spring. (See par. 72c(5), FM 4-135.)

Caution.—The oil buffer spring is under sufficient compression to cause injury to personnel.

c. Barrel group.—(1) Remove barrel by unscrewing from barrel extension.

(2) Remove barrel locking spring by sliding it forward out of its seat in barrel extension.

(3) Push out breech lock pin and remove breech lock.

(4) The barrel sleeve is permanently assembled to the barrel and should not be removed.

d. Cover group (fig. 15).—(1) Remove cover pin cotter pin. Drive out cover pin and lift cover free from trunnion block.

(2) Remove belt feed lever pivot stud cotter pin and pry belt feed lever off its stud, taking care while doing so that the belt feed lever plunger and spring do not fly out. In removing the belt feed lever see that toe of lever is in line with slot in cover, otherwise it will not pass out.

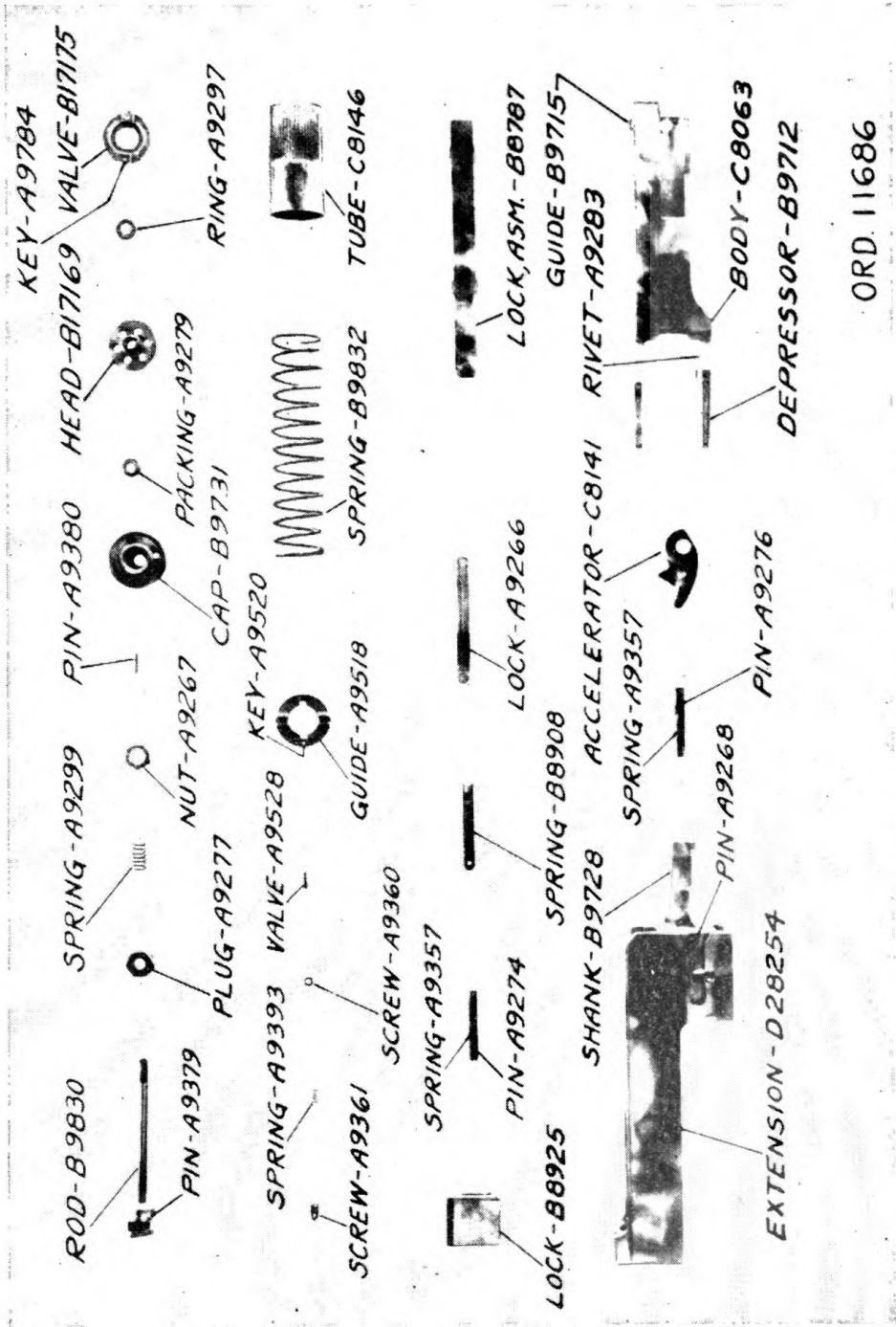
(3) Remove belt feed lever plunger and belt feed lever plunger spring from belt feed lever.

(4) Remove belt feed slide complete from its guides in cover.

(5) Push out belt feed pawl pin which will enable the belt feed pawl, belt feed pawl spring, and belt feed pawl arm to be separated.

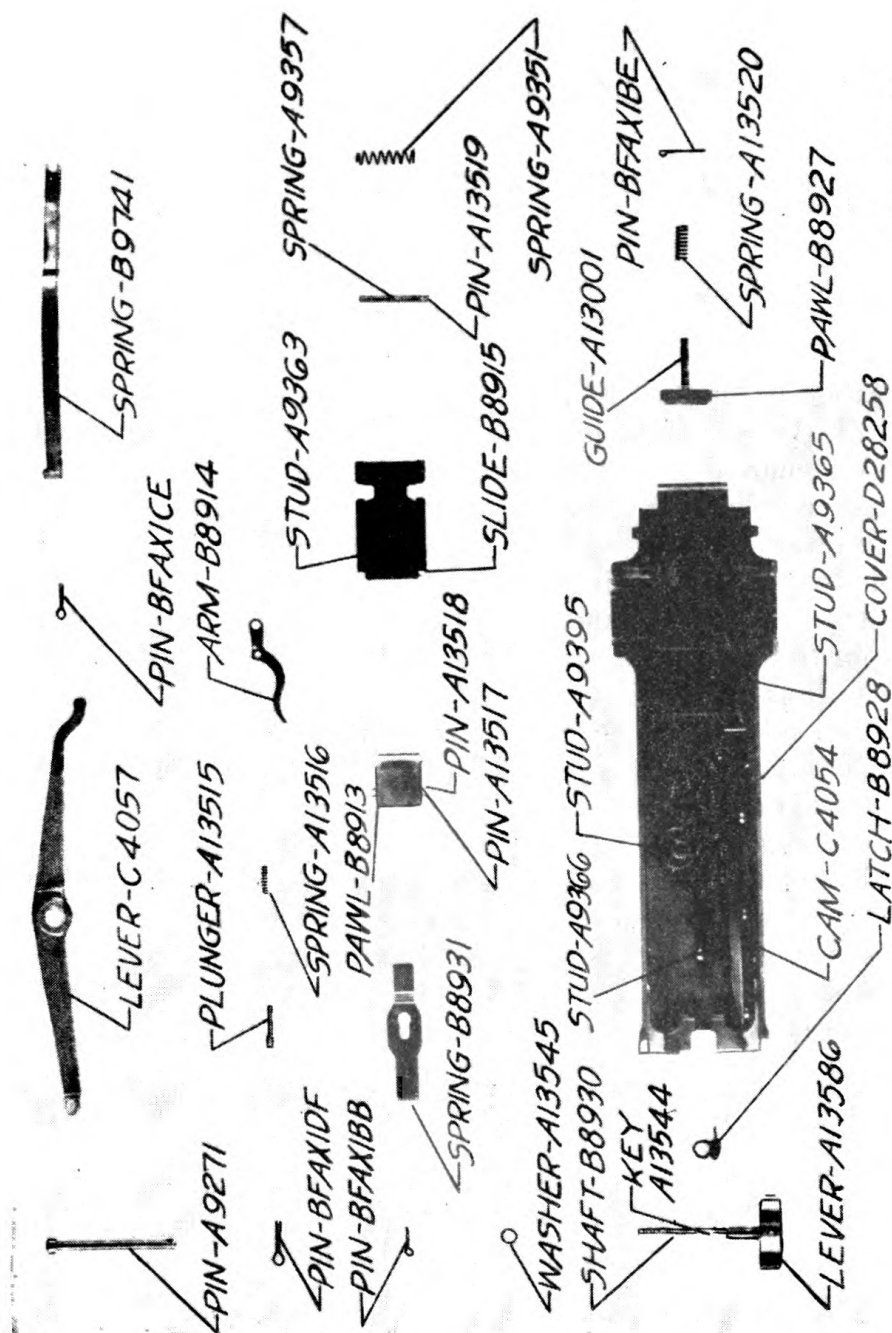
(6) Remove cover latch spring by lifting its front end out of slot in cover and sliding it forward.

(7) Remove cover extractor spring by releasing its rear end from its seat in the cover extractor cam and sliding to the rear.



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FIGURE 14.—Barrel extension and oil buffer group.



ORD. 10758

FIGURE 15.—Cover group.

(8) Withdraw cotter pin from end of cover latch shaft and remove cover latch shaft assembly.

e. Back plate group (figs. 16 and 17).—(1) Drive out back plate latch pin being careful that the back plate latch spring does not fly out upon removal of back plate latch.

(2) Remove cotter pin, drive out latch lock pin, and remove latch lock and latch lock spring.

(3) Drive out trigger pin being careful that the trigger spring does not fly out upon removal of trigger and trigger spacer.

(4) Unscrew adjusting screw, remove adjusting screw plunger and adjusting screw plunger spring.

(5) Remove buffer disks and buffer plate through the rear end of the buffer tube.

f. Casing group (figs. 18 and 19).—(1) To prevent injury to rear sight leaf, the rear sight movable base and rear sight leaf assembly should be removed from the rear sight fixed base. Turn rear sight windage screw knob until rack on movable base is entirely free from windage screw, then lift assembly from movable base pivot. Lift off movable base tension spring.

(2) To remove side plate trigger assembly from casing, withdraw cotter pin from side plate trigger bolt and unscrew side plate trigger nut. To disassemble—

(a) Pull side plate trigger slide out of its guides in the side plate trigger housing.

(b) Drive out side plate trigger pin and remove side plate trigger cam and spring.

(3) To remove retracting slide assembly from casing, pull out locking wires and unscrew retracting slide bracket screws. The components of the retracting slide assembly are shown in figure 20. To disassemble—

(a) Withdraw cotter pin from retracting slide bracket bolt. Unscrew retracting slide nut and remove bolt from retracting slide bracket.

(b) Withdraw cotter pin from retracting slide lever stud. Unscrew retracting slide nut and remove retracting slide lever stud washer. Remove retracting slide lever and retracting slide grip assembly from retracting slide lever stud. Remove retracting slide lever spring.

(c) Remove retracting slide from retracting slide bracket.

(d) The retracting slide stud can be removed from the retracting slide but this should not be done unless necessary for replacement as the stud is staked in place.

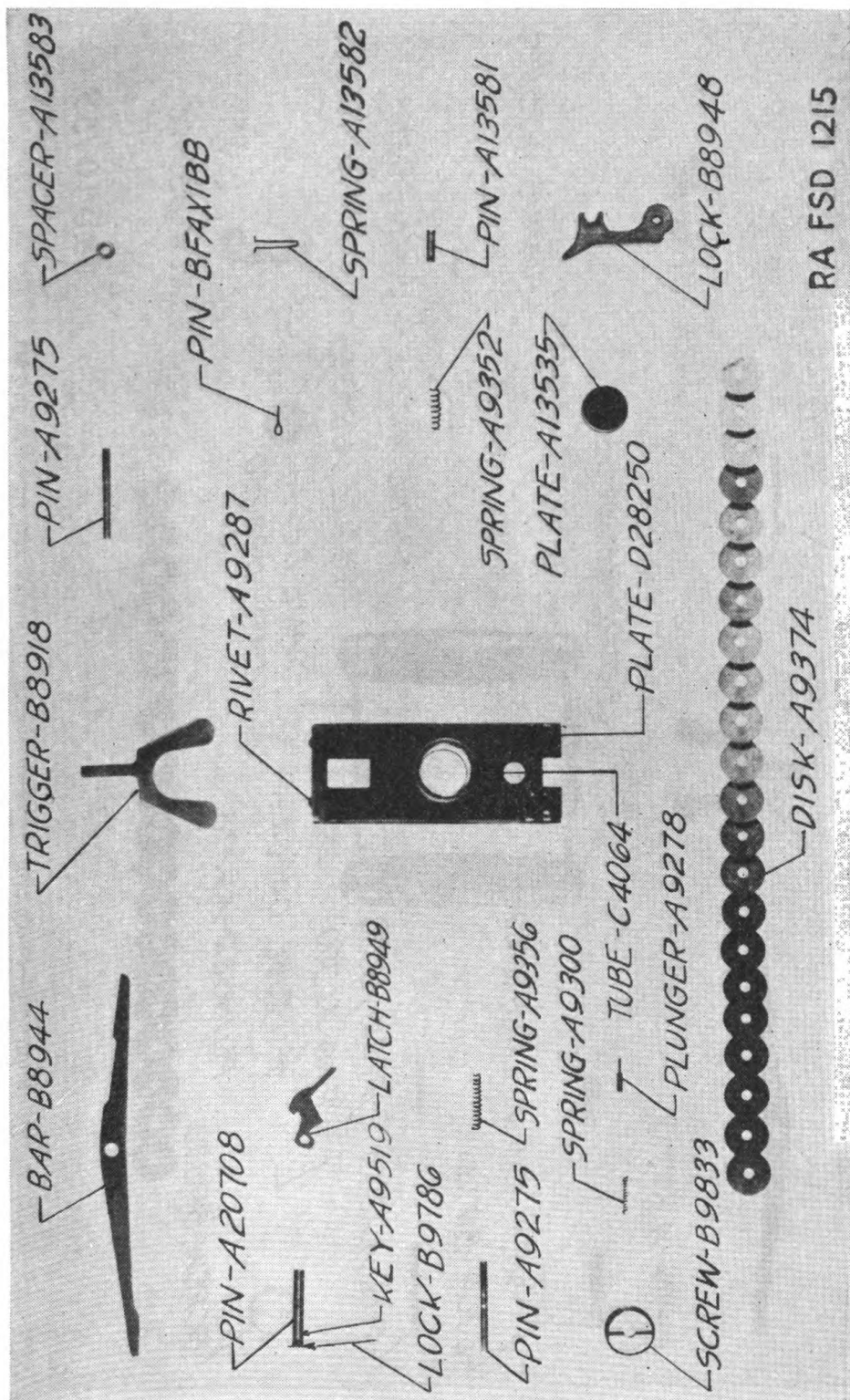


FIGURE 16.—Back plate for use on anti-aircraft machine-gun mount, caliber .50, M2.

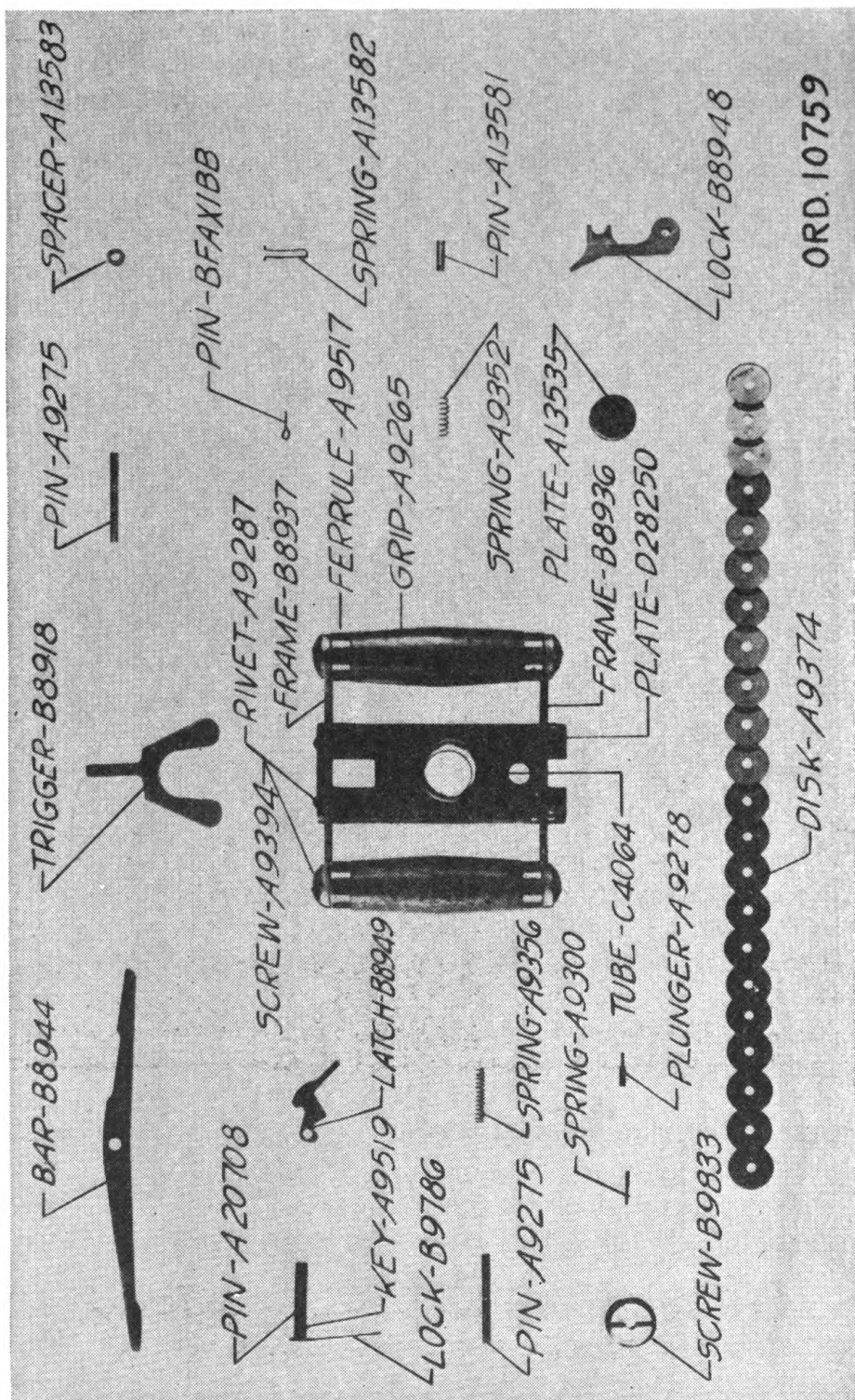


FIGURE 17.—Spade grip back plate for use on antiaircraft tripod mount, M1.

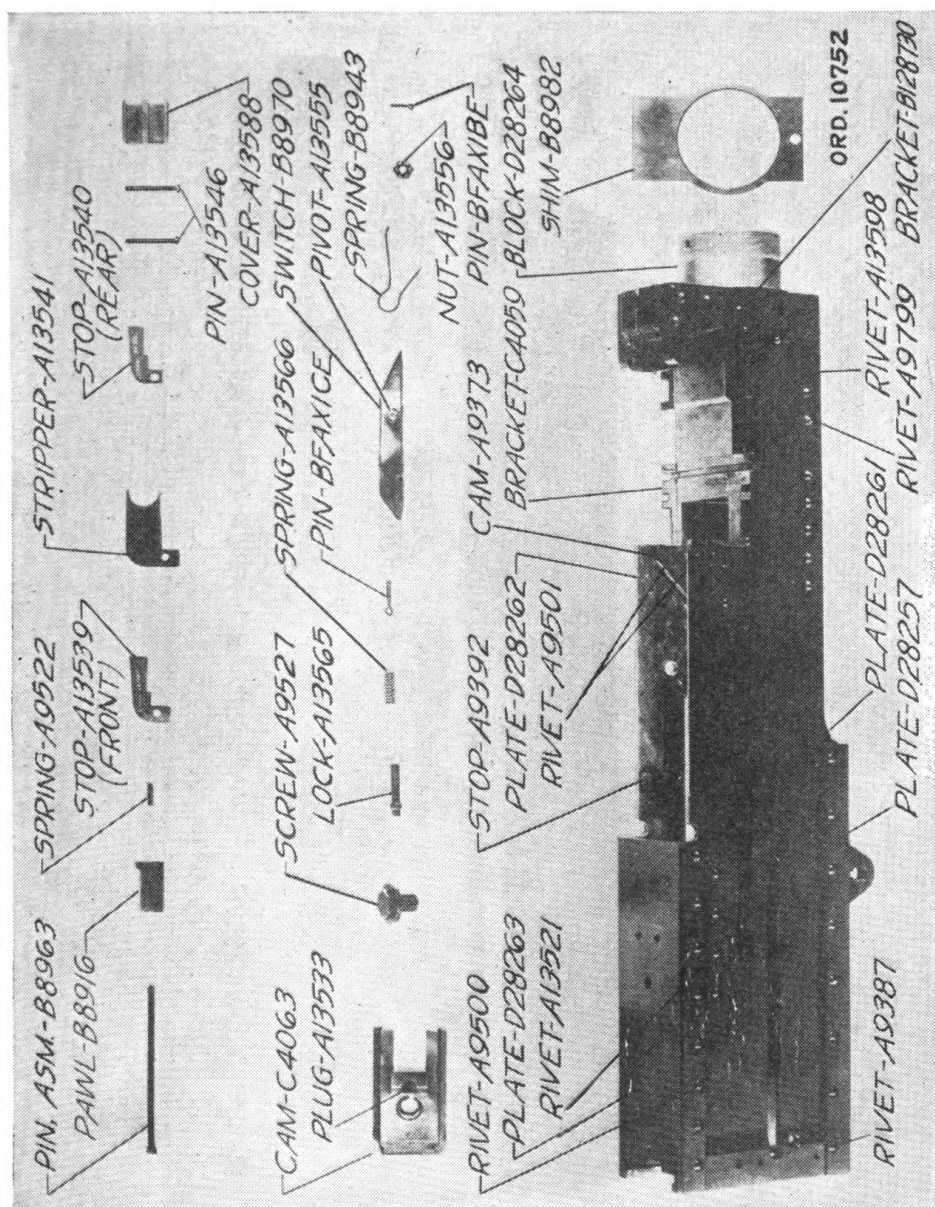


FIGURE 18.—Receiver group.

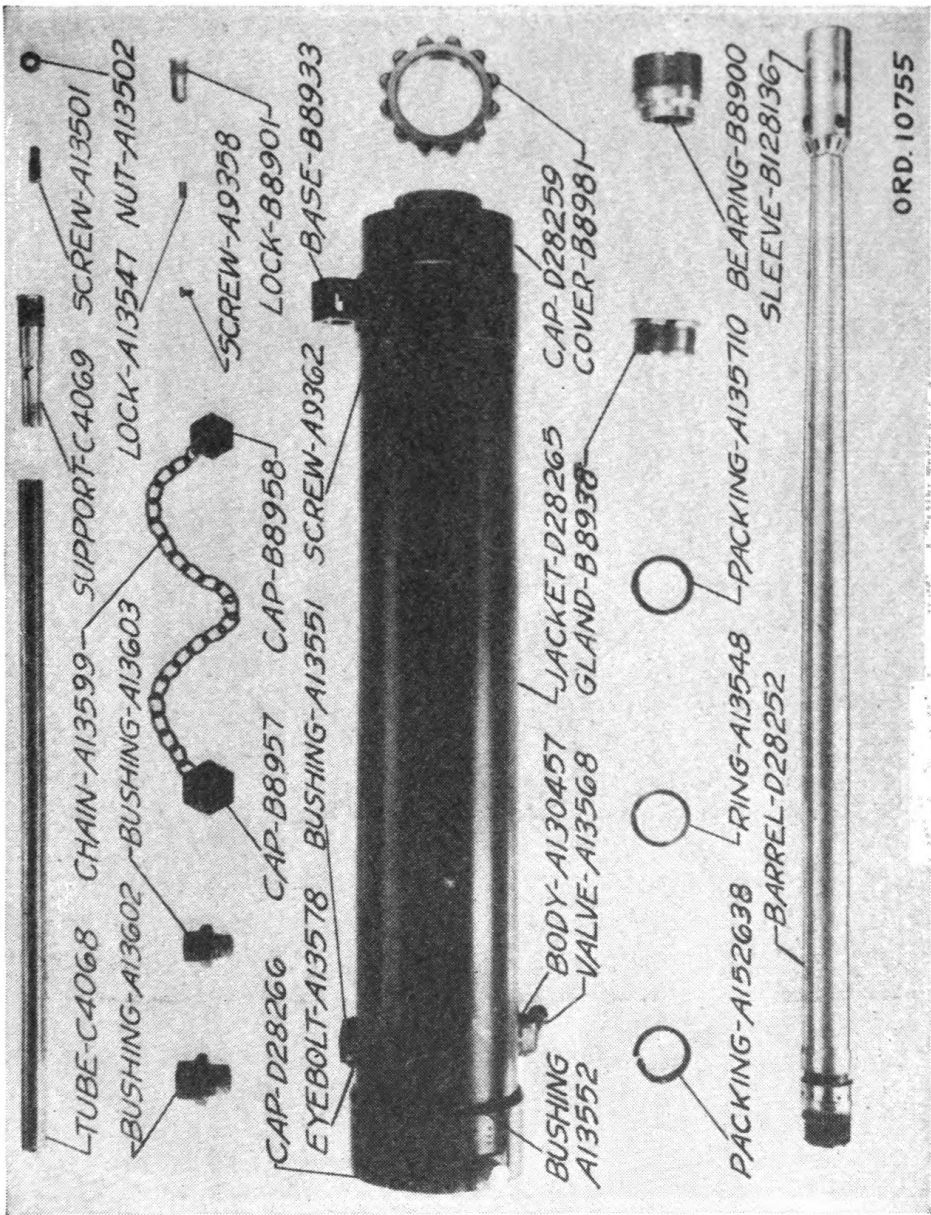


FIGURE 19.—Barrel and water jacket group.

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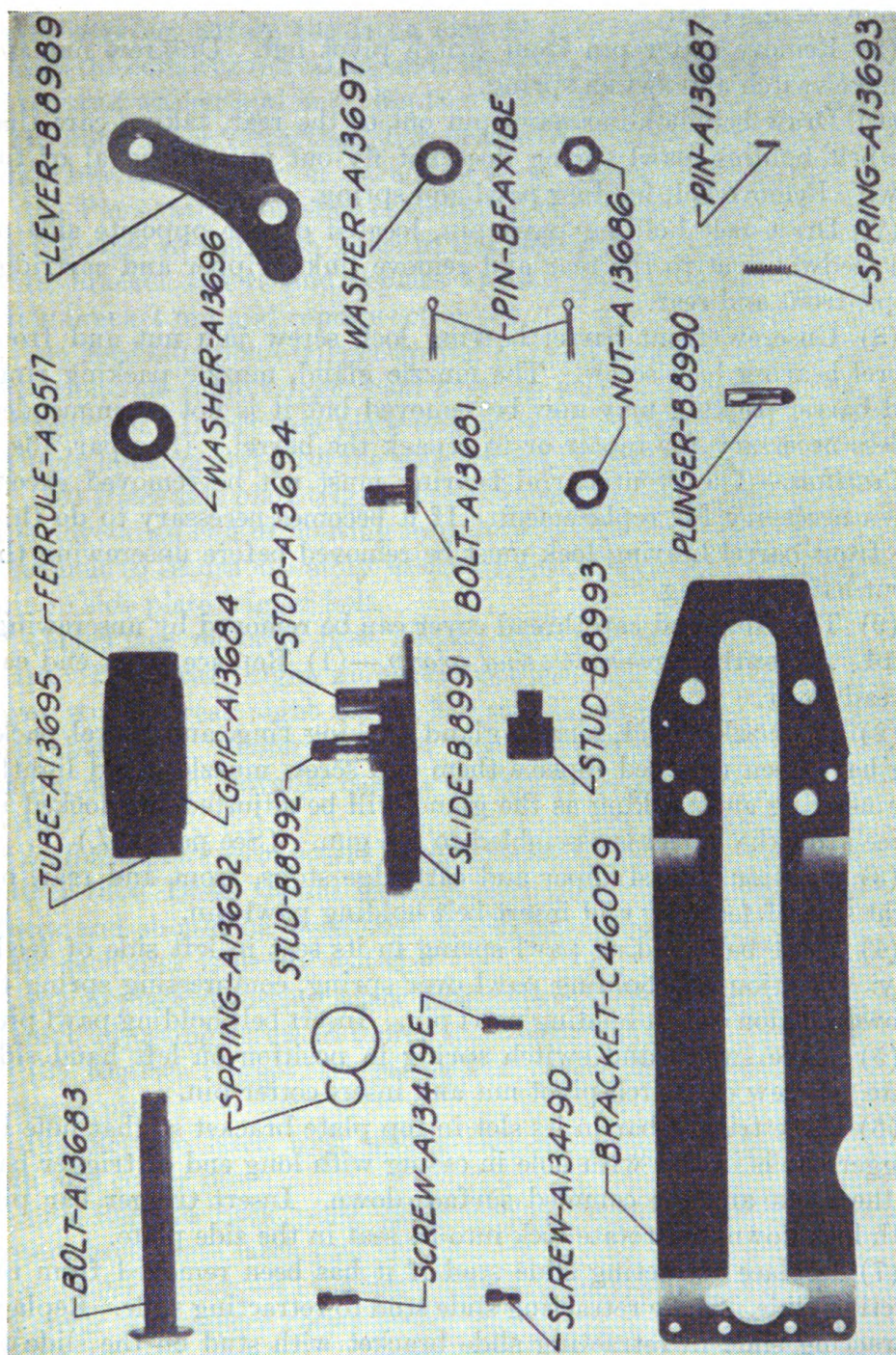


FIGURE 20.—Retracting slide group.

(4) Lift end of trigger bar pin lock from its seat in the side plate, rotate downward about 90° and pull out trigger bar pin. Remove trigger bar.

(5) Remove cotter pin from switch pivot nut. Unscrew nut and remove switch and switch spring.

(6) Draw belt holding pawl pin out to the rear, taking care that the belt holding pawl spring does not fly out upon removal of the pawl. Remove belt holding pawl and spring.

(7) Draw belt holding pawl pin, located on the opposite side of the feedway, out to the rear and remove link stripper and cartridge stops, front and rear.

(8) Unscrew front barrel bearing lock screw jam nut and front barrel bearing lock screw. The muzzle gland, muzzle packing ring, and barrel packing may now be removed but it is not recommended unless necessary for repair or to repack the barrel. (See par. 15*d*.)

Caution.—The front barrel bearing must not be removed except when necessary for replacement. If it becomes necessary to do this, the front barrel bearing lock must be removed before unscrewing the front barrel bearing.

(9) The front end cap thread cover can be removed by unscrewing.

14. Assembling.—*a. Casing group.*—(1) Replace front end cap thread cover.

(2) If muzzle gland, muzzle gland packing ring, and barrel packing have been removed replace them and screw muzzle gland lightly against ring and packing as the gland will be adjusted and locked in place after the barrel is assembled to the gun. (See par. 15*d*.)

(3) Position link stripper and cartridge stops, front and rear, on right side of feedway and insert belt holding pawl pin.

(4) Place belt holding pawl spring in its seat in left side of feedway. Position belt holding pawl over spring, compressing spring to allow insertion of belt holding pawl pin. Insert belt holding pawl pin.

(5) Place switch and switch spring in position on left hand side plate. Screw on switch pivot nut and insert cotter pin.

(6) Place trigger bar in its slot in top plate bracket so that hole in trigger bar is in line with hole in casing with long end of trigger bar to the front and the cammed surface down. Insert trigger bar pin with lock down and rotate lock into its seat in the side plate.

(7) Replace retracting slide stud if it has been removed from retracting slide. Stake retracting slide stud to retracting slide. Replace retracting slide in retracting slide bracket with stud on the slide to the front. Position retracting slide lever spring in its seat in retracting slide lever with large loop of spring over the hole for the

retracting slide lever stud. Place retracting slide lever and spring on retracting slide stud with small loop of spring over retracting slide stop. Rotate retracting slide lever until it clears the stop. Depress lever making certain the large loop of retracting slide lever spring clears the collar of retracting slide lever stud. Replace retracting slide lever stud washer and nut. Replace cotter pin in retracting slide lever stud nut. Place retracting slide bracket bolt in its hole in retracting slide bracket. Screw on retracting slide bracket nut loosely.

(8) Place retracting slide assembly on right side of casing with holes in the slide in line with holes in the side plate. Screw in retracting slide bracket screws and replace locking wires. Tighten retracting slide bracket nut and replace cotter pin.

(9) Seat side plate trigger spring in the side plate trigger housing. Position side plate trigger cam over the spring and insert side plate trigger pin. Insert side plate trigger slide in its guides in side plate trigger housing and push the slide forward into position.

(10) Place side plate trigger assembly on left side of casing, inserting the dovetailed end of housing into the forward slot in side plate. Adjust bolt to secure assembly to casing and tighten nut. Insert cotter pin in side plate trigger bolt.

(11) Place movable base tension spring over stud on rear sight base. Place rear sight movable base and rear sight base assembly over stud in rear sight base. Engage windage screw with rack of movable base. Center sight by turning windage screw until sight index mark on movable base is in line with zero mark on windage scale.

b. Back plate group.—(1) Insert buffer plate and buffer disks in buffer tube. Disks should be clean and free of rough edges and surfaces and should be assembled in the tube one at a time, being sure that each disk is firmly seated.

(2) Replace adjusting screw plunger and spring in adjusting screw. Insert adjusting screw in buffer tube and tighten.

(3) Replace trigger, trigger spacer, and trigger spring and insert trigger pin.

(4) Replace latch lock spring and latch lock. Insert latch lock pin and cotter pin.

(5) Replace back plate latch spring and back plate latch and insert back plate latch pin.

c. Cover group.—(1) Insert cover latch shaft assembly in hole in cover and replace cotter pin.

(2) Place forked end of cover extractor spring over stud in cover and engage the other end of spring in slot in cover extractor cam.

(3) Place cover latch spring over stud in cover and slide forward, making certain that the rear end rests on the cover latch.

(4) Hold belt feed pawl with recess for belt feed pawl spring up and studs to the right. Place belt feed arm over studs on belt feed pawl with belt feed arm pointing to the right and holes in belt feed pawl and arm in alinement. Place belt feed pawl spring in its seat in pawl and position belt feed pawl in belt feed slide. Insert belt feed pawl pin. Insert belt feed slide, complete, in its guides in the cover making certain that belt feed pawl arm is to the rear.

(5) Place belt feed lever plunger and spring in rear hole of belt feed lever. Insert toe of belt feed lever through slot in cover and engaging belt feed slide. Position belt feed lever so that it goes over stud in cover, and at the same time compress belt feed lever plunger and spring so that they clear the side of the cover. Insert cotter pin in stud.

(6) Place cover assembly on trunnion block and insert cover pin. Insert cotter pin in cover pin.

d. Barrel group.—(1) Insert breech lock in its guides in barrel extension making certain that bevel faces of breech lock are to the front with the double bevel on the top. Insert breech lock pin, taking care that both ends of pin are flush with sides of barrel extension.

(2) Replace barrel locking spring by sliding it into its seat in barrel extension.

(3) Screw barrel into barrel extension.

e. Oil buffer group.—(1) *Assembling.*—(a) If the oil buffer tube has been disassembled, place oil buffer spring over oil buffer piston rod. Position oil buffer spring guide so that slot in guide is in line with pin on oil buffer piston rod. Press down on oil buffer piston guide so that oil buffer piston rod pin passes through slot in guide and rotate guide until recesses in the guide are alined with the pin in the rod. Allow pin to seat itself in recesses.

(b) Insert oil buffer body spring lock in its groove in the body and push forward.

(c) Position oil buffer tube lock spring over slot in oil buffer body with flanges of the spring over the enlarged cut in the slot. Depress spring into the cut and slide forward, raising stud end of spring up and over the end of oil buffer to seat stud in hole in oil buffer body.

(d) Insert oil buffer tube assembly in oil buffer body and push forward as far as it will go. Place accelerator, with tips up and the rounded surface to the front, between depressors on oil buffer body and insert accelerator pin, taking care that both ends of pin are flush with the sides of oil buffer body.

(2) *Adjustment of oil buffer.*—(a) The oil buffer is so arranged that it is possible to adjust the speed of the firing of the machine gun. This is accomplished by turning the oil buffer tube the required number of clicks, depending on whether a high rate of fire is desired or a slower rate.

(b) Turning the buffer tube to the right tends to cut off or close the oil buffer which allows it to absorb more recoil and to reduce the rate of fire.

(c) Turning the buffer tube to the left allows the oil buffer to open and allows the oil to pass through larger throttling ports which results in an increased rate of fire.

(d) The oil buffer tube is turned by inserting a screw driver blade into the slot in the rear of the buffer tube through the hole in the back plate.

f. Bolt group.—(1) Assemble firing pin and firing pin extension and insert this assembly into firing pin hole in bolt with the notch of firing pin extension down. Push forward until striker projects through small hole in front of bolt.

(2) Seat sear spring in its recess in bolt. Insert sear in its guides in bolt. Press down on sear enough to allow sear slide to be inserted from left side of bolt. In inserting sear slide the bevel end should be inserted first and the V-cut in the sear slide should be on the bottom. When the cut on the sear slide is over the corresponding cam on the sear, release pressure on sear and the slide will be engaged.

(3) Insert pin of sear stop through firing pin extension and depress sear stop as far as it will go. With thin end of cocking lever, swing the spring end of sear stop into its recess in bolt.

(4) Insert cocking lever in bolt, the rounded nose on lower end of cocking lever to rear of the bolt so that it will properly engage the rear of slot in firing pin extension. Line up the hole in cocking lever with the holes in bolt and insert cocking lever pin from the left side.

(5) Cock by pressing forward on cocking lever. Turn cocking lever to the rear and press in on sear slide to release firing pin and test correctness of the assembly.

(6) Place bolt switch over bolt switch stud with enlarged portion of bolt switch to the front of bolt.

(7) If the ejector and ejector spring have been removed, replace them on the extractor and insert ejector pin. Holding extractor in an upright position insert stud of extractor into the hole in the bolt and rotate downward being sure that the flange on the extractor is under the collar on the bolt.

(8) If driving spring rod has been disassembled, place driving spring over driving spring rod and compress the spring enough to allow the driving spring rod collar to fall below the hole for the driving spring rod collar stop pin. Insert pin and peen the end of pin to prevent loss.

15. Packing barrel.—Remove barrel assembly from gun.

a. To pack breech end.—Unscrew packing adjusting ring and remove old rear barrel packing. Clean recess in barrel and insert new rear barrel packing. Smooth barrel packing until ends meet. Screw packing adjusting ring against barrel packing to hold it in place.

b. To pack muzzle end.—Unscrew front barrel bearing lock screw jam nut and front barrel bearing lock screw. Unscrew and remove muzzle gland. Remove muzzle packing ring and old front barrel packing. Clean out inside of front barrel bearing. Insert new front barrel packing and replace muzzle packing ring and muzzle gland. Screw muzzle gland lightly against ring and packing as the gland will be adjusted and locked in place after the barrel is reassembled in the gun.

c. Reassemble barrel assembly into gun being careful not to injure barrel packing.

d. Adjust front barrel packing (muzzle packing) by tightening or loosening muzzle gland, then lock in place with front barrel bearing lock screw and jam nut.

e. Adjust rear barrel packing (breach packing) by tightening or loosening packing adjusting ring. A packing ring adjusting wrench and a barrel holding wrench are provided for this purpose.

16. Changing barrels.—*a.* Open drain valve and drain water from water jacket into water chest or other suitable receptacle. Remove back plate, bolt, and driving spring assemblies. Remove barrel, barrel extension, and oil buffer assembly by pulling out to the rear. Separate old barrel from barrel extension and replace with new one. Reassemble barrel, barrel extension, oil buffer, bolt, driving spring, and back plate assemblies to the gun. Care must be exercised in removing and assembling the barrel in order not to disarrange the barrel packing. Make head space adjustment as outlined in paragraph 12. Close drain valve and refill water jacket with water. Adjust breech and muzzle barrel packing if necessary.

b. If it is necessary to keep water in water jacket when changing barrels the following method can be employed: Remove back plate, bolt, and driving spring assemblies. Screw union caps to inlet and outlet openings of water jacket and lower muzzle of gun to prevent loss of water at the breech end. Hold a plug at muzzle of barrel. Withdraw oil buffer, barrel extension, and barrel assemblies to the

rear. As the barrel is withdrawn, follow it with the plug and insert plug in hole in muzzle gland through which the barrel has been withdrawn. Place a plug or twisted patch in muzzle of new barrel. Separate old barrel from barrel extension and replace with new one. Reassemble barrel, barrel extension, and oil buffer assemblies into gun. When the muzzle of the new barrel passes through hole in muzzle gland remove plug in the hole. Remove plug in muzzle of barrel and run a cleaning patch through barrel. Reassemble bolt, driving spring, and back plate assemblies into gun. Make head space adjustment as outlined in paragraph 12. Adjust breech and muzzle barrel packing if necessary.

SECTION III

DISMOUNTING AND MOUNTING

	Paragraph
Dismounting antiaircraft machine-gun mount, caliber .50, M2-----	17
Mounting antiaircraft machine-gun mount, caliber .50, M2-----	18
Dismounting antiaircraft machine-gun tripod mount, M1-----	19
Mounting antiaircraft machine-gun tripod mount, M1-----	20

17. Dismounting antiaircraft machine-gun mount, caliber .50, M2 (fig. 21).—*a.* Disconnect flexible cables at front sight mechanism. Remove ammunition chest and disconnect eyebolt (if in use) by unscrewing the hook.

b. Dismounting sights.—Rotate front sight 90° to clear the undercut, and remove front sight. Unlatch clamp of sight support and remove rear sight from rear sight bracket. Loosen lock nut on rear sight clamp, unscrew knob and slide rear sight bracket out of dovetail clamp. Unscrew the two knobs on sight support, pull back on front sight locking plate so that the large openings in the plate can clear the clamping bolts of the sight support. Remove front sight locking plate by unscrewing retaining screw. Raise front sight mechanism out of its dovetail in sight support.

c. Dismounting gun.—Before removing the caliber .50 machine gun from the cradle of the M2 mount, force gun slightly to rear and push down lower recoil slide stop which is located on the right of lower recoil slide. This will prevent the recoil slide from going too far forward when the gun is removed. If this is not done, difficulty will be encountered in properly alining the slide and the gun bracket to insert the rear gun joint pin when mounting the gun. This stop will return automatically to the disengaged position after the first round is fired. Release trunnion cap wing nuts and raise trunnion caps. Pull out rear gun joint pin and lift gun out of cradle. In removing the gun, do not allow side plate trigger to come in contact with cradle as such contact may injure the trigger mechanism.

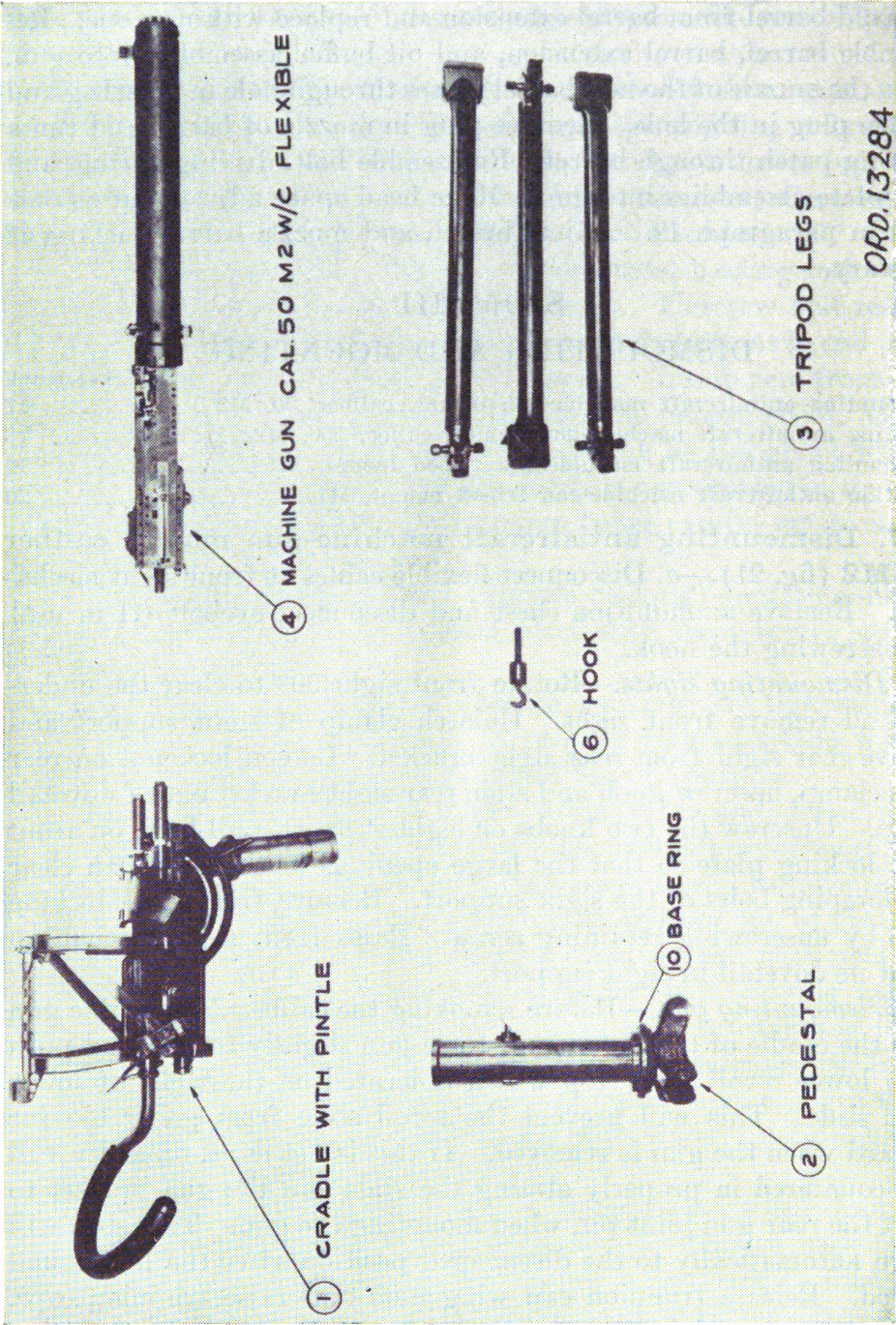


FIGURE 21.—Anti-aircraft machine-gun mount, caliber .50, M2, components and machine gun.

d. Dismounting cradle and pintle.—Release pintle lock on pedestal by placing lever of lock in a horizontal position. Lift cradle and pintle from pedestal.

e. Dismounting tripod legs.—Unscrew leg clamping ring. Release nuts on the bolts which fasten the tripod legs to the base ring by screwing the nuts out against the stops. Remove tripod legs by sliding them downward out of slots in base ring. In removing the legs, the pedestal is tilted so that the leg being removed is clear of the ground.

18. Mounting antiaircraft machine-gun mount, caliber .50, M2.—*a.* Slide legs into slots in base ring and tighten nuts. Tighten leg clamping ring.

b. Raise latch lock lever to horizontal position and place cradle and pintle on pedestal. Latch pintle latch lock.

c. Raise trunnion caps. Place machine gun on cradle with gun trunnions seated in trunnion slides. Lower the rear end of gun over the bracket of the lower recoil slide until holes in gun bracket are alined with holes in slide of recoil mechanism. Insert rear gun joint pin through gun bracket and slide of recoil mechanism.

d. Slide rear sight bracket into dovetail of rear sight clamp. Tighten clamp with the knob and lock in place with the locking nut. Place rear sight in groove in rear sight bracket making sure that the cut on the flange of the rear sight engages the pin in rear sight bracket. Latch rear sight bracket.

e. Place front sight mechanism in its dovetail in sight support. Place front side locking plate over heads of clamping bolts with chamfered side of slots upward. Slide plate forward so that heads of clamping bolts enter narrow portion of slots. Insert and tighten plate retaining screw. Clamp sight mechanism to sight support by tightening clamping knobs. Place front sight with the flat at right angles to the flat on elevating screw head and rotate sight 90° in undercut until the spring actuated plunger in the elevating screw head engages the mating detent in the sight.

f. Connect flexible cables to elevating and traversing mechanisms on front sight assembly.

19. Dismounting antiaircraft machine-gun tripod mount, M1.—*a.* Withdraw trunnion pin and elevating bracket pin and remove gun.

b. Pull out on locking plunger and remove cradle and yoke.

c. Unscrew shoulder stock assembly from front bracket of cradle.

d. Unscrew locking collar from end of shoulder stock assembly, then pull shoulder stock assembly out of rear bracket of cradle.

20. Mounting antiaircraft machine-gun tripod mount, M1—*a.* Insert shoulder stock assembly into rear bracket of cradle and screw locking collar on end of shoulder stock assembly.

b. Screw shoulder stock assembly on front bracket of cradle.

c. Replace cradle and yoke and engage locking plunger.

d. Place gun over cradle so that trunnion pin hole is directly over the caliber .30 trunnion pin hole in rear of cradle, and lower gun and move forward until trunnion pin and elevating bracket pin holes are in line with corresponding holes in cradle. This is necessary as the projecting trunnion block rivets of the caliber .50 gun interfere with the bosses for the caliber .30 trunnion pin holes. Insert elevating bracket pin and trunnion pin.

SECTION IV

STOPPAGES AND IMMEDIATE ACTION

	Paragraph
Stoppages	21
Immediate action	22

21. Stoppages.—*General.*—*a.* A malfunction is an improper action of some part of the gun, resulting in a stoppage; for example, failure to extract the empty cartridge case.

b. Any accidental cessation of fire is a stoppage. It may be a faulty cartridge or a malfunction of some part of the gun.

c. Immediate action is the term applied to that operation required to clear a temporary stoppage.

d. Proper care of the gun and attention to the points before, during, and after firing will greatly reduce the liability to stoppages, particularly if the gunner has an intelligent understanding of the reason why stoppages generally occur. *Prevention is the best remedy for all stoppages.*

Caution.—After any stoppage which appears to be caused by insufficient recoil, make sure that the bore is clear before continuing firing. It is possible that such a stoppage, for instance, one caused by incomplete ignition of the powder charge, may result in the bullet lodging in the bore, and in case this happens and another round is fired before the bore is cleared, the gun certainly will be seriously damaged.

e. Classes.—Stoppages may be classed under two main headings:

(1) *Temporary.*—Temporary stoppages are caused by—

(a) Failure of some part, duplicate of which is carried with the gun.

(b) Faulty ammunition.

(c) Neglect of points before or during firing.

(2) *Prolonged*.—Prolonged stoppages are caused by a failure of some part that, as a rule, cannot be remedied by the gun squad under fire or without skilled assistance. These necessarily put the gun out of action for a more or less prolonged period.

f. Unusual malfunctions.—(1) *Recurring short rounds*.—Excessive wear of the parts of the feed mechanism may cause recurring short rounds. Inspection of the base of the first cartridge removed from the belt will show a dent in the rear end of the case made by the corner of the extractor. This stoppage is remedied by inspecting feed mechanism and replacing defective parts. Inspection of ammunition belts before firing will disclose short rounds inherent in the ammunition.

(2) *Loose bullets*.—In some lots of ammunition which have deteriorated from storage or exposure, the front end of the case is not securely crimped on the bullet. When the extractor withdraws the cartridge from the belt the case only is withdrawn, leaving the bullet in the belt. Loose powder scattered in the mechanism may cause a stoppage. This stoppage is remedied by removing the obstruction. The best prevention of this type of stoppage is a rigid inspection of ammunition prior to firing.

(3) *Broken T-slot*.—A broken T-slot will fail to extract the empty case from the chamber and will usually scar the rim of the case. This stoppage is remedied by replacing the bolt.

(4) *Broken barrel extension*.—The bolt will not go home and the gun will generally stop firing. In rare cases the gun will fire a few rounds with a broken barrel extension. This stoppage is remedied by disassembling the gun and replacing the broken part.

(5) *Uncontrolled automatic fire*.—Uncontrolled automatic fire is the continuation of fire when the trigger or sear mechanism is released. If the cause is present before the gun is fired it will commence the moment the bolt is home the second time during loading; or if the defect occurs during firing, the gun will not stop firing when the trigger or sear mechanism is released.

(a) *Cause*.—The forward end of the trigger bar sprung downward, or the beveled surfaces of the trigger bar and sear burred.

(b) *To remedy*.

1. Keep gun directed on target.

2. Unlatch cover.

3. Unload and disassemble gun. Replace broken, worn, or burred parts.

(6) *Tight packing*.—Too tight packing will result in sluggish operation and stoppages. Muzzle packing is more likely to cause trouble than breech packing.

(7) *Classified table of stoppages.*—The following table will serve as a guide during instruction in stoppages or immediate action:

TABLE OF STOPPAGES

Stoppages	Method of preparation for instruction in immediate action and stoppages
- Misfire due to defective primer. - Short round. - Bulged round. - Tight link in the belt.¹ - Thin rim, permitting the nose of the bullet to drop below chamber.¹ - Belt improperly loaded. - Battered or thick rim of cartridge. - Failure to remove round from chamber. - Set-back primer.¹ - Separated case which is removed from chamber by new round when bolt is pulled to rear. - Separated case, which stays in the chamber when bolt is pulled up to rear. (Do not set up loose head space.) - Bullet loose in cartridge case. Cartridge case extracted from belt but bullet remains in belt.¹ - Short or broken firing pin. - Weak or broken firing pin spring. - Faulty engagement of firing pin and sear notch. - Broken sear spring. - Bent or worn belt feed lever. - Belt feed pawl spring out or weak. - Belt feed pawl pin out or partially out. - Cover extractor spring out or weak. - Belt feed lever bent up (stud on lever jumps out of cam groove). - Damaged extractor. - Belt-holding pawl out or spring weak. - Broken extractor or ejector. - Broken or damaged T-slot in bolt.¹ - Weak ejector spring. - Broken barrel extension. - Defective trigger mechanism.^{1 2} - Defective bolt switch.¹ - Bent or broken belt feed pawl arm.¹	- Place dummy cartridge in belt. - Place short round in belt. - Insert bulged round in belt. - Do not prepare.¹ - Do not prepare.¹ - Pull cartridge partially out of belt. - Place battered or thick-rimmed cartridge in belt. - Place dummy cartridge with rim filed off in chamber. - Do not prepare.¹ - Drive front portion of a cartridge securely on a dummy cartridge. Pull bolt to rear and place cartridge properly on face of bolt. Ease bolt forward. - Insert front end of a separated case in chamber, and load. - Do not prepare.¹ - Place five or six successive range dummy cartridges in belt for instruction in immediate action. - Same as 13. - Same as 13. - Same as 13. - Assemble cover with defective part. - Remove belt feed pawl spring. - Remove belt feed pawl pin. - Remove cover extractor spring. - Assemble with defective part. - Same as 21. - Remove belt-holding pawl. - Assemble bolt with defective part. - Do not prepare.¹ - Assemble with defective part. - Assemble with defective part. - Do not prepare.^{1 2} - Do not prepare.¹ - Do not prepare.¹

¹ Not prepared for instruction in immediate action.

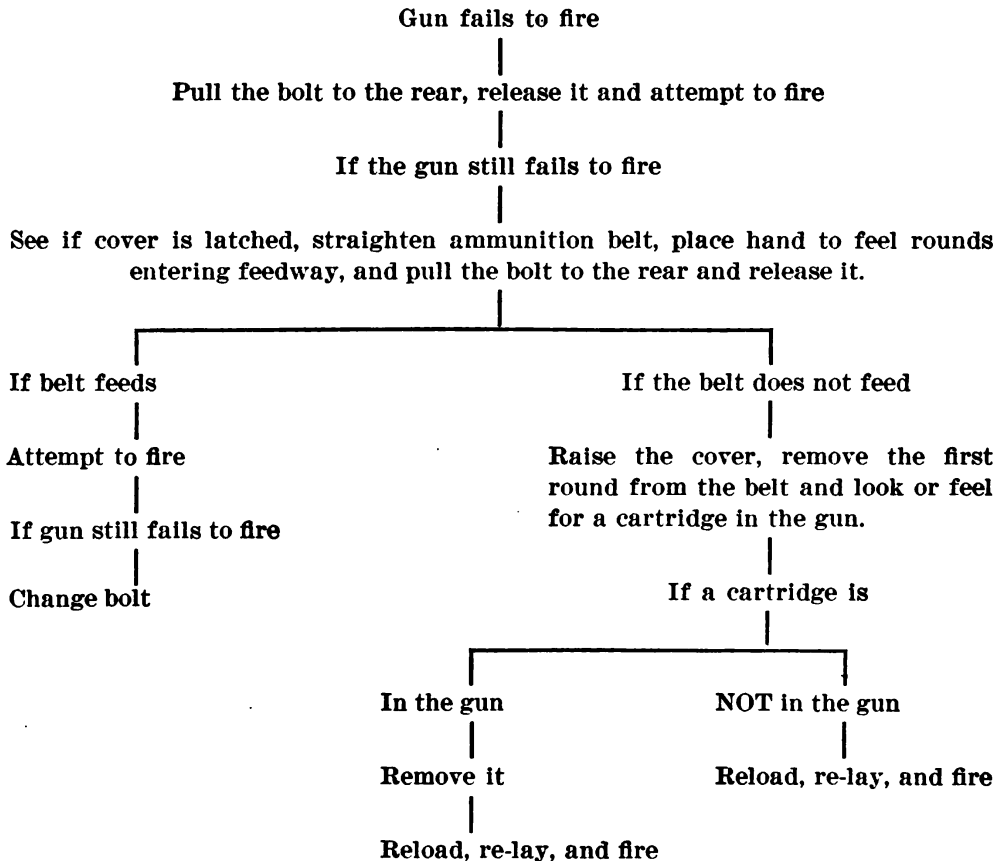
² Defective trigger mechanism may cause the gun to begin firing as soon as it is loaded or to continue to fire when the trigger is released. To remedy, unlatch the cover or twist the belt, unload, disassemble the gun, and replace the defective part or parts.

22. Immediate action.—*a.* Immediate action is the immediate and automatic application of a procedure designed to reduce the majority of stoppages and place the gun in action in the shortest possible time. Immediate action is concerned with the reduction of stoppages and not the cause.

b. Proper preparation of the gun and inspection of the loaded belts to eliminate loose bullets, bulged round etc., should practically eliminate the need of immediate action.

c. When a stoppage occurs during firing, the immediate action in the diagram below, or such portions as are required to reduce the stoppage will be performed.

TABLE OF IMMEDIATE ACTION



NOTE.—If application of the procedure does not remedy the stoppage, the gunner must examine the feed mechanism and other parts of the gun in order to locate and remedy the trouble.

SECTION V

CARE AND PRESERVATION

	Paragraph
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Points to be observed before, during, and after firing-----	24
Care and cleaning of gun-----	25
Method of filling oil buffer-----	26
Precautions to be observed during cold weather-----	27
Precautions to be observed during gas attack-----	28

23. General.—The importance of a thorough knowledge of how to care for and clean the machine gun cannot be overemphasized. The kind of attention given to a weapon of this type determines largely whether or not it will shoot accurately and function properly when needed. The bore and chamber must be kept in perfect condition for accurate shooting. Also it is just as important that the receiver and moving parts be kept clean, lubricated, and in perfect condition for efficient functioning.

24. Points to be observed before, during, and after firing.—The following table of points to be observed before, during, and after firing will be found convenient as a guide for the proper care of the gun at all times. It will also serve as a guide for the inspection of the gun.

25. Care and cleaning of gun.—*a. Cleaning bore.*—(1) Disassemble groups from gun.

(2) Place barrel, muzzle down, in a vessel containing hot water and issue soap, a sal soda solution, or, lacking these, hot water alone.

(3) Insert cleaning rod with a flannel patch assembled in the breech. Move rod forward and back for about 1 minute, pumping water in and out of bore.

(4) Use a brass or bronze wire brush while the bore is wet, running it forward and back through the barrel three or four times.

(5) Pump water through bore again to clean.

(6) Dry the cleaning rod and remove barrel from water. Using dry, clean flannel patches, thoroughly swab bore until it is perfectly dry and clean. Thoroughly dry and clean the chamber using a flannel patch on a stick if necessary.

(7) Saturate a patch with sperm oil and swab bore and chamber with the patch. Allow a thin coat of the oil to remain in the bore.

(8) Guns should be cleaned not later than the evening of the day on which the gun is fired, preferably immediately after cessation of firing.

(9) Inspect and clean the guns for 3 days following cessation of firing.

b. Cleaning parts other than bore.—(1) Wipe receiver clean, care being taken to remove dirt from belt holding pawl. Thoroughly clean cover, bolt, barrel extension, oil buffer, and back plate, using a small stick covered with a flannel patch to remove dirt from all recesses.

(2) Wipe all parts with an oily rag.

(3) The gun should be examined to see if the barrel packing is in good condition.

c. Cleaning tripod.—(1) The tripod should be given care equal to that given the gun. All parts which are painted when issued will be kept at all times properly protected by olive-drab paint. Whenever the tripod is used, all dirt, sand, and mud will be removed by wiping or if necessary by washing and drying. Keep all threads lightly oiled.

(2) For the antiaircraft machine gun mount, caliber .50, M2, use Navy contract #2110 lubricating oil. Lubricate the slide of the recoil mechanism through the oil hole located in the top of the slide. The slide should be lubricated every 2 hours during continuous firing. The elevating and traversing screw should be oiled with a few drops of oil every day.

d. Preparation for storage.—(1) Clean and prepare the guns with particular care. All parts of the gun should be cleaned and wiped thoroughly dry with rags. In damp climates particular care must be taken to see that the rags are dry. After drying, the bare hands should not touch the parts; handle with an oily rag.

(2) Apply rust-preventive compound to all metal parts of the gun. Rust-preventive compound, medium (U. S. A. Spec. 2-84A), is a slug-gish liquid which pours at a temperature of 81° F. It is used for short time protection and should not be used on guns put in permanent storage. It may be applied with a brush or by dipping. In applying, heating is not necessary except in very cold temperatures. Application of the rust-preventive compound to the bore of the machine gun barrel is done best by dipping the cleaning brush in rust-preventive compound and running it through the bore two or three times. Prior to placing the weapon in storage the bolt should be in the forward position with the firing pin released. In fact it is good practice to relieve the firing pin tension whenever the weapon is not in use.

(3) The wooden supports in the packing box must be painted with rust-preventive compound before storing the gun. Place the gun in the wooden packing box, handling the gun with oiled rags.

e. Guns received from storage.—Machine guns received from storage are completely coated with rust-preventive compound. Use dry-cleaning solvent to remove all traces of this grease, particular care being taken that all recesses in which springs or plungers operate are cleaned

Spare parts and tools-----	Keep clean and oiled. See that kits are complete.	Keep within reach-----	Make repairs. Replace broken or worn parts. Note performance on gun report.	Check, replace broken or missing parts, clean, and oil. Complete gun record.
Gun record-----	Check from last firing to see that repairs have been made. For overhead fire see that 5,000 rounds per barrel have not been exceeded.	-----		

¹ If the gun is fired without circulating unit the outlet hole in the water jacket must be left uncovered.

thoroughly. After using the dry-cleaning solvent make sure it is completely removed from all parts by wiping thoroughly. The bore and chamber of the barrel must be thoroughly cleaned. All surfaces having been thoroughly cleaned they should then be protected with a thin film of lubricating oil applied with a rag.

NOTE.—Failure to clean the firing pin and driving spring and the recesses in the bolt in which they operate may result in gun failure at normal temperatures, and will most certainly result in serious malfunctions if the guns are operated in low temperature areas as rust-preventive compound and other foreign matter will cause the lubricating oil to congeal or frost on the mechanism.

f. Dry-cleaning solvent (Fed. Spec. P-S-661a).—This is a noncorrosive petroleum distillate of low inflammability, used for removing grease. It is generally applied with rag swabs to large parts and as a bath for small parts. The surfaces must be thoroughly dried immediately after removal of the solvent. To avoid leaving finger marks, which are ordinarily acid and induce corrosion, gloves should be worn by persons handling parts after such cleaning. Dry-cleaning solvent will attack and discolor rubber.

g. Lubricating oil.—(1) Proper oiling is second in importance only to intelligent cleaning. It is a vital necessity for the working parts but should be used sparingly. Oil all bearing surfaces of the gun before firing, taking particular care to see that the exterior of the barrel is oiled at the breech end, also that the cover extractor spring, the cover extractor cam, and the cover detent pawl are oiled. Oil the cocking lever, the groove in the bolt for the belt feed lever, the grooves in the barrel extension to take the bolt ribs, the breech lock cam, the switch, the extractor cam, the sear mechanism, and the ways of the belt feed slide.

(2) If the gun is to be fired in areas where the temperature is 45° F. or above, sperm oil should be used when available. When not available, motor oil, weight 20, or any light grade machine oil may be used in an emergency.

(3) On all types of machine guns when operated in areas where the temperature is below 45° F., aircraft instrument and machine-gun lubricating oil (U. S. A. Spec. 2-27D) should be used.

(4) For lubricating the M2 mount, sperm oil (U. S. A. Spec. 2-45A) or aircraft instrument and machine-gun lubricating oil (U. S. A. Spec. 2-27D) should be used under the same conditions as in the case of the gun. If either of these is not available, any suitable motor oil or machine oil may be used.

26. Method of filling oil buffer.—Remove the oil buffer tube filling screws from the base of the buffer tube. Use the oil buffer filling oiler filled with machine gun recoil oil (U. S. A. Spec. 2-77). In an emergency any light recoil oil may be used, adding glycerin in freezing temperatures if necessary. Start the flow of oil by pressing on the base of the oiler. While the oil continues to pour from the oiler, insert nozzle into either filling hole and with a continued pressure on the base of the oiler allow oil to flow into the buffer tube. *Do not release pressure on oiler until nozzle has been removed from filling hole, thus avoiding getting air bubbles into the buffer tube.* Repeat the operation until the buffer is overflowing. Replace the filling screws. Any excess oil in the buffer will be relieved by the relief valve in the forward end of the buffer body. The reason that two filling holes are provided is to show visually by overflow when the buffer tube is completely full.

27. Precautions to be observed during cold weather.—*a.* See that the water in the cooling system does not freeze. In locations where the atmospheric temperature is frequently below 32° F., it is necessary to have an antifreeze mixture of some kind available that can be used in the water jacket that will not freeze nor gum and yet will cool the barrel. Engine crank case oil drainings are excellent for this purpose and their use is authorized. It must be remembered that this mixture cannot be used satisfactorily where the atmospheric temperature is in excess of 32° F. No circulating unit or steam condensing device is necessary when oil drainings are used in the water jacket but the outlet hole must be uncovered before the gun is fired.

b. Test the gun frequently to see that it functions properly.

c. During cold weather when the gun is silent, the movable parts in the receiver of the gun must be kept absolutely dry and free from oil but before firing the gun the moving parts should be oiled.

28. Precautions to be observed during gas attack.—*a.* Cover guns with waterproof sheet if available.

b. Work recoiling parts if the gun is not being fired.

c. Guns should be cleaned as soon as possible after a gas attack.

d. Oiling will prevent corrosion for about 12 hours.

e. Clean all metal parts in boiling water containing a little soda.

f. All traces of gas must be removed from ammunition with a slightly oiled rag, then thoroughly dry the ammunition.

g. Rust-preventive compound resists gas corrosion more than lighter oil.

SECTION VI

SIGHTING AND FIRE CONTROL EQUIPMENT

	Paragraph
Control equipment set, automatic gun, antiaircraft, M1.....	29
Finder, range, 1-meter base, M1916.....	30

29. Control equipment set, automatic gun, antiaircraft, M1.—One automatic gun antiaircraft control equipment set, M1 (figs. 22 and 23) is furnished for each firing unit of four Browning machine guns, caliber .50, M2, water-cooled. The set complete consists of the control box, twenty 50-foot flexible shafts including two spares, and the necessary packing chests for control box and flexible shafts.

a. Description.—The control equipment set is a manually operated mechanical data transmission system, used to transmit corrected deflection data to the sighting systems of the guns. Vertical and lateral deflections, determined by a computing device if available, not a part of the set, are transmitted by flexible input shafts to the control box of the set. If the computing device is not available, the deflections are set in manually by the officers directing the fire. This control box (fig. 24), which is not a computing device, contains differential drives whereby corrections may be added to the values received, and follow-the-pointer mechanisms, driven by handwheels, whence the corrected data are transmitted by the flexible output shafts to the sights of the guns.

b. Operation.—(1) Set up the control box. Carry the control box in its packing chest to the desired location which should be on firm, level ground. Release the four trunk bolts and remove the lid of the packing chest. Grasp the control box by the base and lift it from the chest. Remove the operator seat locking pins holding the folding seat supports to the bottom of the chest. Unfold the seats upward and outward until the seats are substantially level and the holes in the projecting legs of the horizontal seat supporting bars are alined with the holes in the blocks at the ends of the packing chest. Insert the operator seat locking pins in the holes. Slide the seats outward to the desired location, the removable support arm locking pins being provided under each seat to permit this adjustment. Place the control box on the blocks ahead of the seats and screw the wing screws upward securely into the threaded holes in the base of the box. The appearance of the control box and packing chest when ready to operate is as shown in figures 22 and 23.

(2) Set the control box indexes to “normal”, the positions shown in figure 24, if they are not already in that position. First turn the

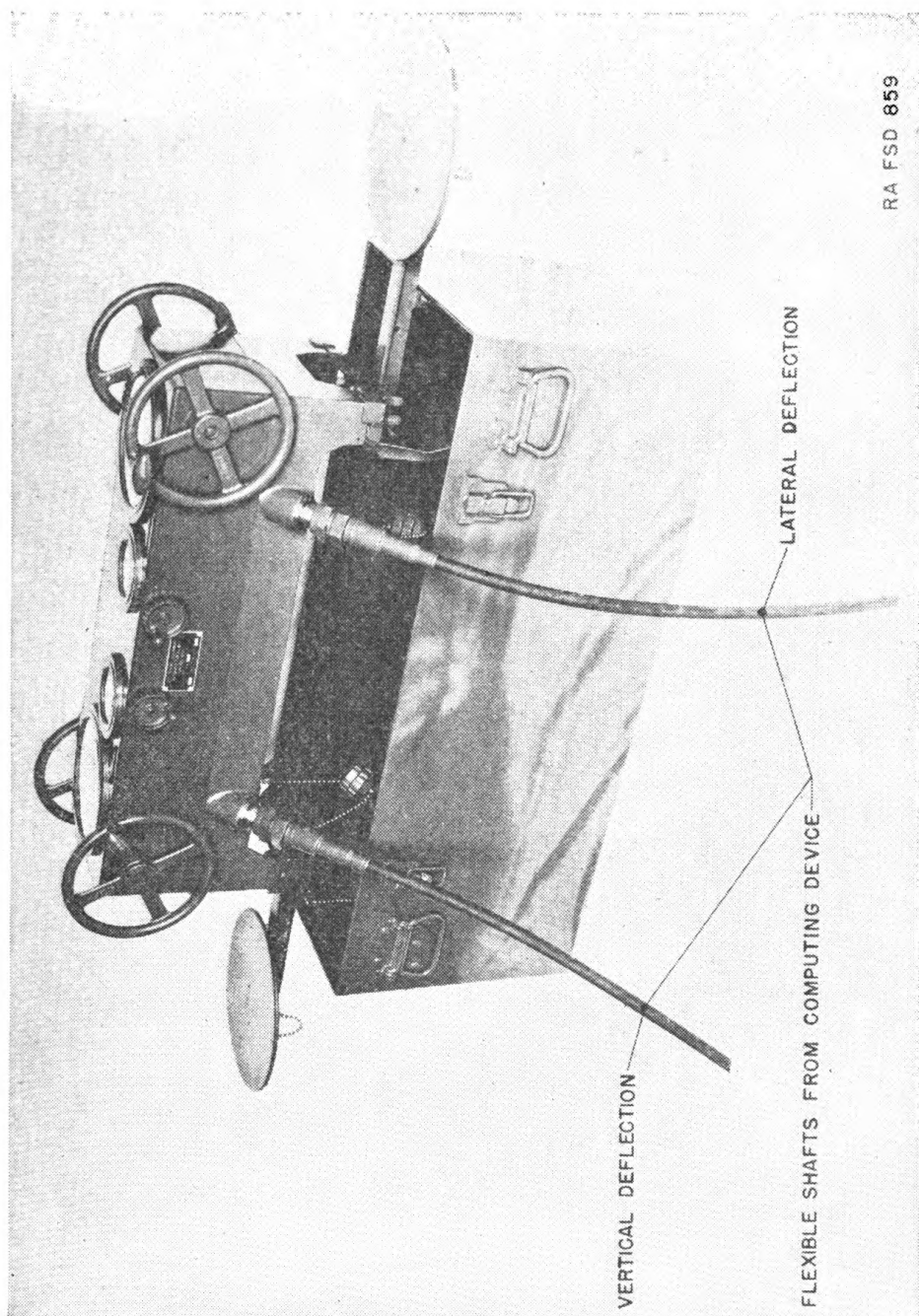


FIGURE 22.—Automatic gun antiaircraft control equipment set, M1, input side.

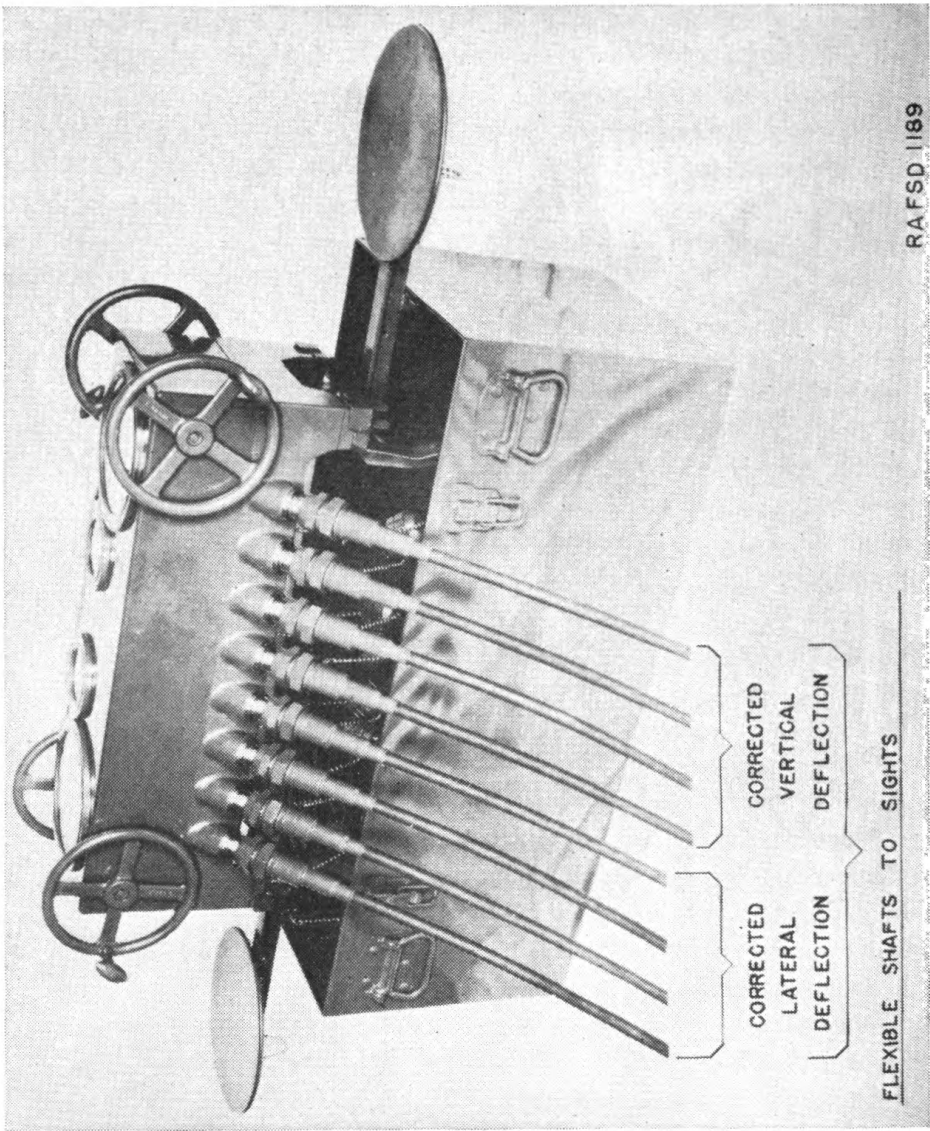
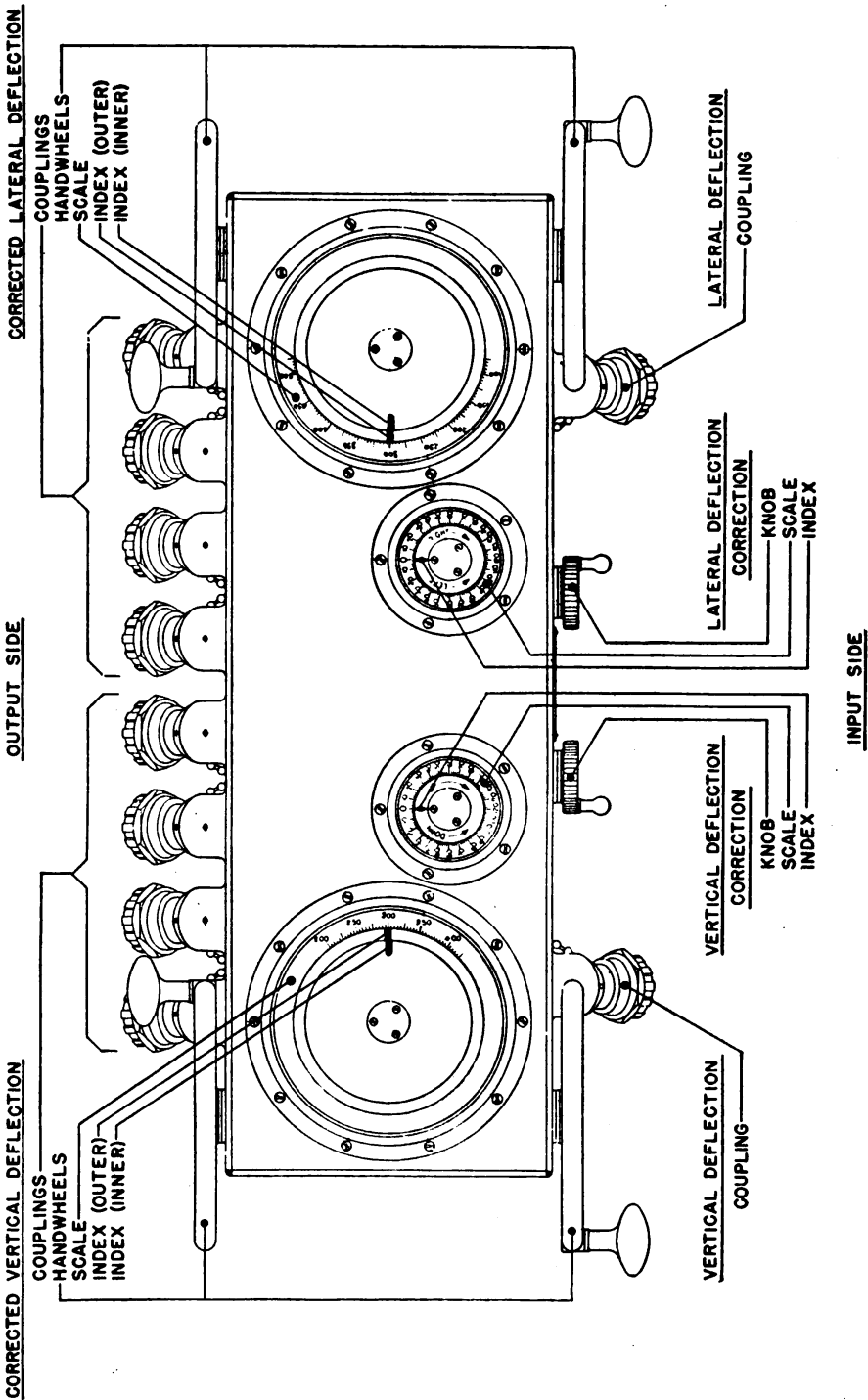


FIGURE 23.—Automatic gun antiaircraft control equipment set, M1, output side.



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FIGURE 24.—Control box, automatic gun antiaircraft control equipment set, M1.

deflection correction knobs until their respective indexes indicate zero, then turn the handwheels until the outer indexes indicate 300 (normal). If each inner index does not then match the outer index, unscrew the cover over the associated input coupling and turn the coupling as required to bring the indexes into coincidence.

(3) Set the computing device and the sight on each gun to "normal".

(4) Remove the required number of flexible shafts from their packing chests. The lateral and vertical deflection drives of each gun sight require connection to one of the corresponding output couplings of the control box. The lateral and vertical deflection couplings of the computing device are also to be connected to the corresponding input couplings of the control box. For runs longer than 50 feet, couple the required number of flexible shafts, using the minimum number possible. To take up any excessive shaft length, lay the shaft in large arcs. Sharp bends must be avoided as the resulting increased friction may cause incorrect transmission of data. Where flexible shafts are coupled together, or are coupled to a receptacle, screw the covers of the mating parts together to protect the threads.

(5) After the system has been completely connected, set in any required corrections to lateral and vertical deflections, using the associated knobs, and operate the handwheels so as to match their respective outer indexes continuously with the inner indexes.

(6) It is also possible to set corrected deflections, when known, on the control box directly, the values transmitted being those indicated by the outer index on the associated scale. The position of the inner index and the correction settings are then disregarded.

(7) To prepare the set for traveling, remove the flexible shafts from their receptacles and replace all covers. Wipe all dirt and water from the control box. Slide the seats to their innermost position. Place the seats and control box in the packing chest, following in reverse order the procedure given for setting up the control box. Grasp the control box by the base when lifting. Wipe off the water and dirt from the flexible shafts and roll them up to the proper radius for packing in the chests. Each packing chest accommodates four flexible shafts.

c. Care and preservation.—(1) Do not kink the flexible shafts nor bend them at a short radius. Exercise care to prevent their being chafed, rubbed, or crushed.

(2) Keep the flexible shaft casing free from oil.

(3) Keep the ends of the couplings clean and lightly oiled with neutral oil, and the covers in place when not in use.

(4) Ball bearings and gears are lubricated at assembly. Lubrication of these parts is required only at long intervals and is to be performed by ordnance personnel.

(5) Access by the using arm to the internal parts of the control box or flexible shafts for lubrication or other purposes is not permitted. Adjustment of stops by the using arm is not permitted.

(6) When placing a new control box in service be certain that the box is arranged for use with caliber .50 machine guns. Note the graduations on the corrected deflection scales which should range from 75 to 525 for lateral deflection and from 200 to 425 for vertical deflection. Note also the location of the stops. They should function close to the maximum and minimum scale graduations.

(7) Do not connect up a flexible shaft until the elements connected have been set to "normal." Also do not interconnect couplings not carrying the same element of data.

(8) The control box should not be lifted by the handwheels.

30. Finder, range, 1-meter base, M1916.—This instrument (figs. 25 and 26) is used primarily for measuring distance by triangulation. Indications of azimuth and angle of site are also provided.

a. Description.—The instrument includes an internal 1-meter base line, a 15-power optical system with two objectives, a common eyepiece of the coincidence type, and a scale on which the distance is indicated. It is furnished complete with mount and tripod. The necessary carrying cases and adjusting equipment are provided. The mount positions the line of sight of the range finder in elevation and azimuth and provides a hinge joint for placing the base line axis of the instrument in either a vertical or a horizontal position. Angle of site and azimuth scales and micrometers are provided on the mount.

b. Operation.—(1) To set up the instrument, clamp the tripod legs securely at the desired length, embed them firmly in the ground, and tighten the leg clamping levers. It is necessary that the azimuth scale be in a substantially horizontal plane. Place the range finder on the mount and latch it in position. Position the longitudinal axis horizontally and clamp with the hinge clamping handle. Procedure for a vertical base line is described in (5) below.

(2) To prepare the optical system for use, rotate the end box sleeves, uncovering both windows. Set the ray filter lever to the proper position. No filter at all may be used, or the amber filter (for exceptionally bright daylight or reflection of sun over water) or the smoked filter (for observation near the sun or into direct rays of a searchlight) may be employed as required. Focus the eyepiece by rotating the diopter

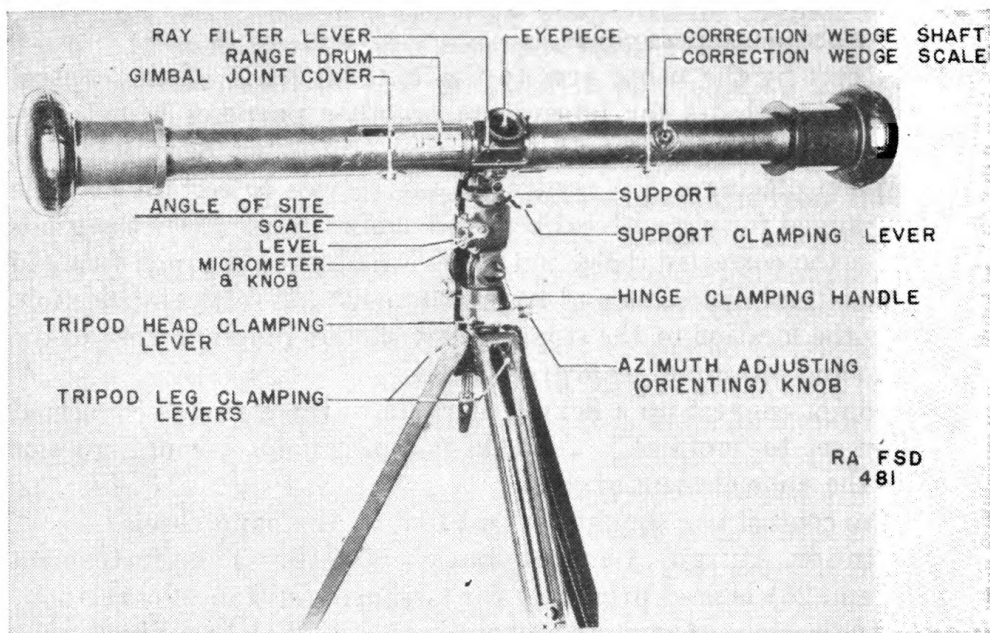


FIGURE 25.—Range finder, 1-meter base, M1916, rear view.

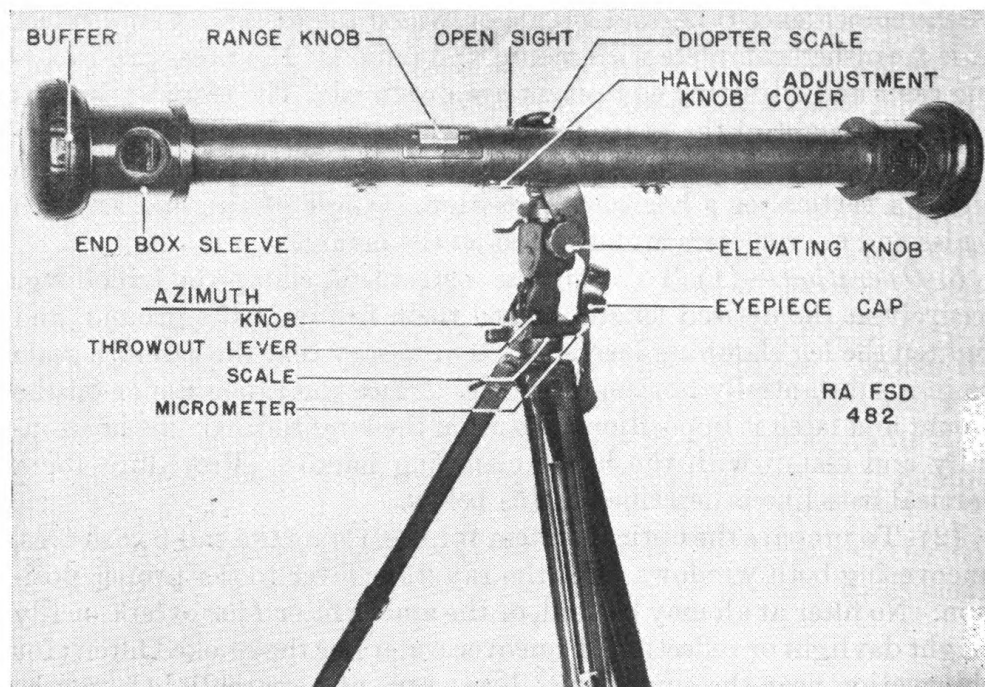
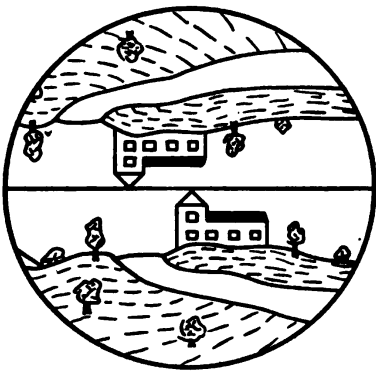


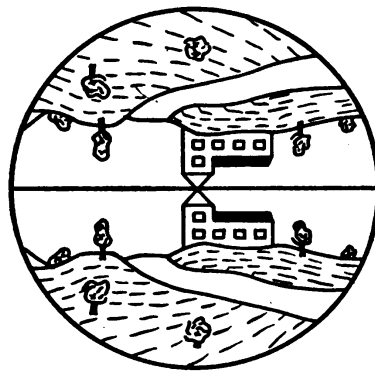
FIGURE 26.—Range finder, 1-meter base, M1916, front view.

scale to produce a clear image. If the operator knows the value for his own eye, the setting may be made directly on the scale.

(3) To orient the instrument, select a datum point of known azimuth. Set this value of azimuth on the azimuth scale and micrometer. Loosen the tripod head clamping lever and swing the instrument until the datum point appears near the vertical center line of the field of view, indicated by a short line in the lower field of view. Clamp the lever and refine the setting with the azimuth adjusting (orienting) knob so that the point appears exactly on the vertical center line.



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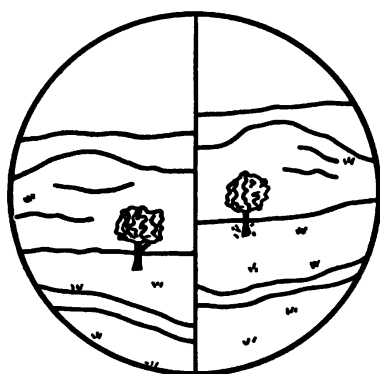
FIGURE 27.—Range finder field of view, horizontal base.

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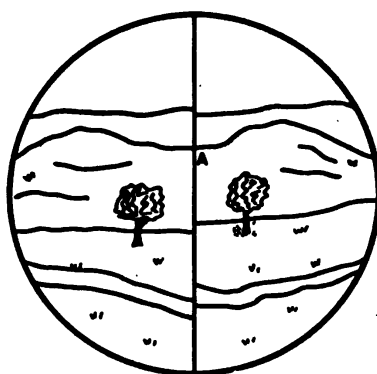
(4) To measure the range of an object, select a clearly defined point perpendicular if possible to the halving line. Move the instrument in azimuth and elevation as required to bring the point at the center of the field of view when in coincidence. On moving targets it is advisable to start with the target at the edge of the field of view so that it may be brought into coincidence as it crosses the field. An open sight is provided for picking up the target. For large angular displacements in azimuth, depress the throw-out lever and turn the instrument as required. When first observed, the images will ordinarily not be in coincidence (fig. 27①). Turn the range knob until the images of the point selected appear in coincidence (fig. 27②). Read the range in yards on the range drum opposite the sliding range pointer.

(5) To measure the range of horizontal objects such as roads, trenches, crests of ridges, etc., which have no prominent vertical parts, turn the instrument with the longitudinal axis vertical, loosening the hinge clamping handle temporarily for the purpose. The images

when first observed will ordinarily not be in coincidence (fig. 28①). Turn the range knob until the image of the horizontal line appears to continue across the halving line (as at A in fig. 28②). Lower the support clamping lever temporarily for any necessary motion in elevation (within the limits of $\pm 40^\circ$).



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FIGURE 28.—Range finder field of view, vertical base.

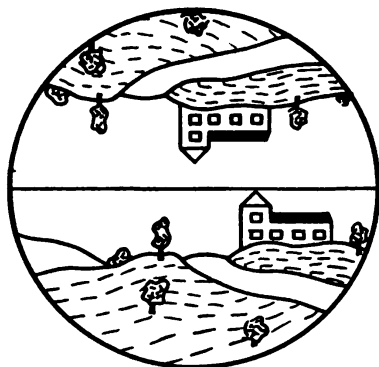
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(6) To read angle of site, center the level bubble by using the angle of site knob. The angle of site indication may then be read on the associated scale (100-mil steps) and micrometer (1-mil steps). An indication of 300 mils corresponds to a horizontal line of sight. Angle of site can be read only when using the instrument with the longitudinal axis horizontal.

(7) To read azimuth, the azimuth scale (100-mil steps) and micrometer (1-mil steps) furnish the necessary indications. It is essential that the plane of the azimuth scale be substantially level and that the object be at the center of the field of view for correct angular indications. Azimuth may be measured with the longitudinal axis either vertical or horizontal, but the instrument must be oriented separately for each position. Azimuths from 3,200 to 6,400 mils have an additional auxiliary scale reading from 0 to 3,200 mils for use with panoramic telescopes similarly graduated.

(8) To prepare the instrument for traveling, cover the eyepiece and close the end box sleeves and the cover over the range drum. Remove the range finder from the mount and place in its case. Place the mount and tripod in their case, with the elevating knob toward the inside of the case. Do not remove the mount from the tripod. Remove the sight from the adjusting lath. Place the lath in the internal pocket of the tripod carrying case and the sight in the lid pocket. The latter pocket also contains the correction wedge key and a camel's-hair brush.

c. Tests and adjustments.—(1) *Halving line.*—Incorrect adjustment of the halving line is indicated by the failure of the corresponding points on the inverted and erect images to fall on the halving line (fig. 29). To correct the halving, slide back the cover exposing the halving adjustment knob and rotate the knob until the corresponding point of each image touches the halving line (as in fig. 27① and ②). A sharply defined point at least 400 yards away must be used for this adjustment. Return the cover to its original position when the adjustment is completed.



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FIGURE 29.—Range finder field of view, incorrect halving.

(2) *Range indications.*—(a) To test the instrument using a finite range, select a sharply defined object at a distance of 400 yards or more, the range of which is accurately known, and bring the object into coincidence in the center of the field of view (fig. 27②). If the range adjustment is correct, the known range should be indicated.

(b) To test using the moon or other celestial body (not the sun), proceed as for an object at finite range. Infinite range (∞) should be indicated.

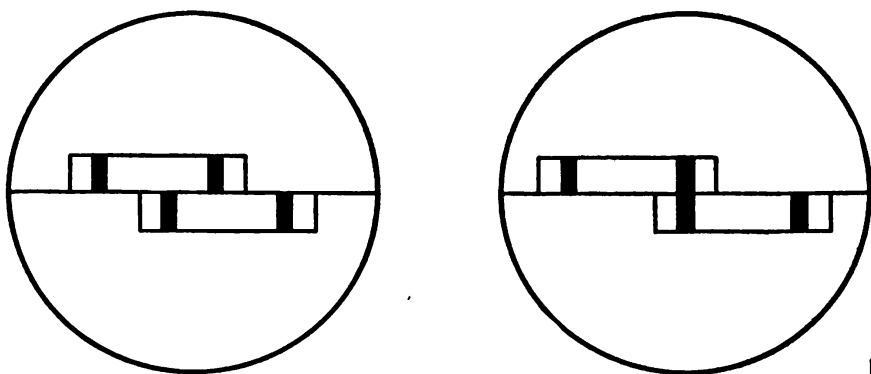
(c) To test the instrument by the infinity method, prepare the adjusting lath by inserting the sight. Place the adjusting lath in a horizontal position 125 yards or more from the instrument. Use the sight on the lath to insure perpendicularity to the line of sight. Set the range drum to indicate infinite range (∞). If the images appear aligned as in figure 30②, the adjustment is correct. Misalignment, such as is shown in figure 30①, indicates the necessity for adjustment.

(d) To adjust the instrument in range, set the range at the known range, or at infinity, depending on the method of test employed, and bring the images into correct relation using the correction wedge key to turn the correction wedge shaft. Note the indication on the correction wedge scale. Repeat several times and set the scale to the average of the readings.

(e) It is essential that the adjusting lath, when used, be the one belonging with the instrument. The same serial number is provided on both.

(3) *Azimuth indications.*—Should the azimuth scale and micrometer fail to indicate zero simultaneously, the latter may be slipped around as required, temporarily loosening the clamping screw in the end.

(4) *Angle of site indications.*—Sight on a point at least 125 yards distant, at the same level as the range finder. The angle of site indication should be “normal” (300 mils). Corrections for small errors may be applied by slipping the angle of site micrometer through the required angle after temporarily loosening the clamping screw in the end.



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FIGURE 30.—Range adjustment, infinity method.

d. Care and preservation.—(1) *General precautions.*—(a) The range finder is rugged and suited for the purposes for which designed. It will not, however, stand rough handling or abuse. Inaccuracy or malfunctioning will result from such mistreatment.

(b) Disassembly and assembly by the using arm are permitted only to the extent authorized for proper operation and adjustment. Unnecessary turning of screws or other parts not incident to the use of the instrument is expressly forbidden.

(c) Any range finder which indicates incorrectly or fails to function properly after the authorized tests and adjustments have been made is to be turned in for repair by ordnance personnel. Adjustments other than those expressly authorized herein are not to be performed by the using arm.

(d) The gimbal joint cover is not to be removed by the using arm.

(e) Keep the cover over the halving adjustment knob closed except when making an adjustment.

(f) Do not point the range finder directly at the sun. This instrument contains a cemented prism which will be injured by such practice.

(g) Avoid striking or bumping the instrument at the ends when mounted as the parts at the center will thereby be subjected to excessive stress.

(h) When not in use, keep the instrument and tripod in the carrying case.

(i) Keep the range finder as dry as possible. Do not put it in its case when wet.

(j) Painting of fire control equipment by the using arm is forbidden.

(k) The azimuth drive has a throw-out mechanism to permit rapid motion through large angles. When using this mechanism, it is essential that the throw-out lever be fully depressed to prevent injury to the worm and gear teeth.

(l) When mounting the instrument on the tripod be certain that the tripod legs are clamped tightly.

(m) When setting up tripods on sloping terrain, place two legs on the downhill side to provide maximum stability.

(2) *Leather articles.*—Care and preservation of leather articles are covered in AR 30-3040.

(3) *Optical parts.*—(a) To obtain satisfactory vision, it is necessary that the exposed surfaces of the lenses and other parts be kept clean and dry.

(b) Under no conditions will polishing liquids, pastes, or abrasives be used for polishing lenses and windows.

(c) For wiping optical parts use only paper specially authorized for cleaning optical glass. Use of cleaning cloths is not permitted. To remove dust, brush the glass lightly with a clean camel's-hair brush. If necessary rap the brush against a hard body in order to remove small particles of dust that cling to the hairs. With some instruments an additional brush with coarse bristles is provided for cleaning mechanical parts. It is essential that each brush be used only for the purpose intended.

(d) Particular care should be exercised to keep optical parts free from oil and grease. Do not wipe the lenses or windows with the fingers. To remove oil or grease from optical surfaces, apply ethyl alcohol with a clean camel's hair brush and rub gently with clean lens paper. If alcohol is not available, breathe heavily on the glass and wipe off with clean lens paper. Repeat this operation until clean.

(e) Moisture due to condensation may collect on the optical parts of the instrument when the temperature of the parts is lower than that of the surrounding air. This moisture, if not excessive, can be re-

moved by placing the instrument in a warm place. Heat from strongly concentrated sources should not be applied directly, as it may cause unequal expansion of parts which may result in breakage of optical parts or inaccuracies in observation.

(4) *Lubricants*.—Exposed moving parts of the mount should be oiled occasionally using neutral oil. Interior parts of the mount and range finder are not to be lubricated by the using arm. Keep excess lubricant that seeps from the mechanisms wiped off to prevent accumulation of dust and grit.

SECTION VII

AMMUNITION

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31. General.—The information in this section pertaining to the several types of cartridges authorized for use in the Browning machine gun, caliber .50, M2, water-cooled, includes a description of the cartridges, means of identification, care, use, and ballistic data.

32. Nomenclature.—The cartridges described herein are listed in SNL T-1. Standard nomenclature of ammunition items is used in this manual whenever reference is made to specific items. It should be noted that this nomenclature completely describes the cartridge as to type, caliber, and model. Its use for all purposes is mandatory.

33. Classification.—*a.* Based upon use, the principal classification of the small arms ammunition used in this machine gun is—

- (1) Ball, for use against personnel and light matériel targets.
- (2) Armor piercing, for use against armored vehicles, concrete shelters, and similar bullet resisting targets.
- (3) Tracer, for observation of fire and incendiary purposes.

b. Other types provided for special purposes are—

- (1) Blank, for simulated fire, signaling, and salutes.
- (2) Dummy, for training (cartridges are inert).

34. Identification.—*a. General.*—Even though the caliber .50 cartridges are not marked or stamped to indicate the type or model, each may be identified as described below. In general, the only stamping on the cartridge is that of the manufacturer's initials and year of loading which appear on the base of the cartridge case. However, the marking on all original packing containers, both boxes and cartons, clearly and fully identifies the ammunition except as to grade. (See par. 38.) In addition to the marking, colored bands painted on the ammunition boxes and on carton labels provide a ready means of identification as to type. (See par. 39*a* and *b*.)

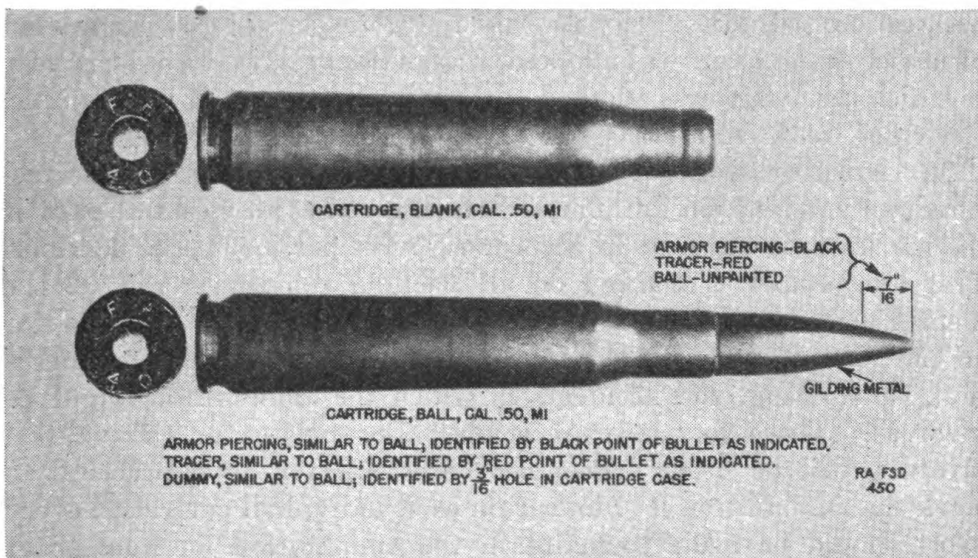


FIGURE 31.—Caliber .50 cartridges.

b. When removed from their original packing containers, the cartridges may be identified, except as to ammunition lot number and grade, by physical characteristics as described below and shown in figure 31. Care should be taken not to confuse these original markings with any subsequent markings made with lithographic marking ink, which is used for an entirely different purpose. (See par. 39.)

(1) *Ball.*—Cartridge, ball, caliber .50, M1, is the standard ball ammunition for this weapon. Cartridge, ball, caliber .50, M1923, is limited standard and when the present stock is exhausted no more will be manufactured. All caliber .50 ammunition have bullets with copper colored, gilding metal jackets.

(2) *Armor piercing*.—All models of caliber .50 armor-piercing ammunition may be distinguished by the nose of the bullet which is painted black for a distance of approximately $\frac{7}{8}$ -inch from the tip.

(3) *Tracer*.—Caliber .50 tracer ammunition may be identified by the nose of the bullet which is painted red for a distance of approximately $\frac{7}{8}$ -inch from the tip.

(4) *Blank*.—Blank ammunition may be identified by the absence of a bullet in the cartridge case.

(5) *Dummy*.—The caliber .50 dummy cartridge may be identified by a hole in the body of the cartridge case.

35. Model.—To identify a particular design a model designation is assigned at the time it is classified as the adopted type. The model designation becomes an essential part of the standard nomenclature of the item and one of the means of identification, for example, Cartridge, ball, caliber .50, M1. Prior to July 1, 1925, when the present system of model designation was adopted, it was the practice to use the year in which the design was adopted as the model designation for example, Cartridge, ball, caliber .50, M1923.

36. Ammunition lot number.—When ammunition is manufactured, an ammunition lot number, which becomes an essential part of the marking, is assigned in accordance with pertinent specifications. This lot number is marked on all packing containers and on the identification card inclosed in each packing box. It is required for all purposes of record including grading and use, reports on condition, functioning, and accidents in which the ammunition might be involved. Those lots only of grades appropriate for the weapon involved will be fired. (See par. 38.) Since it is impractical to mark the ammunition lot number on each individual cartridge, every effort should be made to maintain the ammunition lot number of the cartridges once they are removed from their original packing. Cartridges which have been removed from original packing and for which the ammunition lot number has been lost are placed in grade 3. Therefore when cartridges are removed from their original packings they should be marked so that the ammunition lot number may be preserved.

37. Identification card.—An identification card, approximately 7 by 15 inches, showing the quantity, type, caliber, model, ammunition lot number, and manufacturer, is sealed inside the metal liner on top of the ammunition in each box.

38. Grade.—AR 775-10 explains the meaning of grading of caliber .50 ball ammunition. Ordnance Field Service Bulletin 3-5 lists numerically each lot of ammunition with its correct grade as estab-

lished by the Chief of Ordnance. Lots of proper grade only will be fired. *Grade 3 indicates unserviceable ammunition and will not be fired.*

39. Marking.—*a.* Color bands painted on the sides and ends of the packing boxes further identify the various types of ammunition. The following color bands are used:

Cartridge, armor piercing-----	Blue on yellow.
Cartridge, ball-----	Red.
Cartridge, ball, and Cartridge, tracer, in metallic link belts-----	Composite band of yellow, red, and green stripes (yellow on left, red in center, green on right).
Cartridge, blank-----	Blue.
Cartridge, dummy-----	Green.
Cartridge, tracer-----	Green on yellow.

b. Carton labels are similarly marked to show the quantity, type, caliber, model, ammunition lot number, and manufacturer. Color stripes similar to those on the packing boxes are also printed on the labels, except that for blank ammunition the label itself is blue and for dummy ammunition it is green.

a. Lithographic marking ink.—The number of hits made upon a target by a certain machine gun or group of machine guns when others are firing upon the same target is sometimes determined by coating the tips of the bullets with lithographic ink. The bullets from each weapon or group of weapons are coated with a distinctive color of ink which upon striking the target leaves a smear indicating the source of fire. Cartridges which have been so coated must have the ink removed before return to storage.

40. Care, preservation, and handling.—*a.* Ammunition boxes should not be opened until the ammunition is required for use. Ammunition removed from the airtight container, particularly in damp climates, is apt to corrode, thereby causing the ammunition to become unserviceable.

b. The ammunition should be protected from mud, sand, dirt, and water. If it gets wet or dirty, wipe it off at once. Verdigris or light corrosion should be wiped off. Cartridges should not be polished, however, to make them look better or brighter.

c. The use of oil or grease on cartridges is prohibited.

d. Do not fire cartridges with loose bullets or other defects.

e. Ammunition should not be exposed to the direct rays of the sun for any length of time. This is likely to affect seriously its firing qualities.

f. Whenever cartridges are taken from cartons and loaded into belts the latter will be tagged so that the ammunition may be identified as to lot number. Tagging is necessary in order to preserve the grade of the ammunition.

g. No caliber .50 ammunition will be fired until it has been positively identified by lot number as published in Ordnance Field Service Bulletin 3-5.

41. Storage.—*a.* Whenever practicable, small arms ammunition should be stored under cover. This applies particularly to tracer ammunition which is subject to rapid deterioration if it becomes damp, and may even ignite spontaneously. When necessary to leave small arms ammunition in the open, raise it on dunnage at least 6 inches from the ground, and cover it with a double thickness of paulin. Suitable trenches should be dug to prevent water flowing under the pile.

b. If practicable, tracer ammunition should be stored separately from other ammunition.

c. Fire hazard.—If tossed into, or placed in a fire, small arms ammunition does not explode violently. There are small individual explosions of each cartridge, the case flying in one direction and the bullet in another. In case of fire, keep the personnel not engaged in fighting the fire at least 200 yards from the fire and have them lie on the ground. It is unlikely that the bullets and cases will fly over 200 yards.

42. Authorized rounds.—The following ammunition of suitable grade (par. 38) is authorized for use in the machine gun previously mentioned:

Cartridge, armor piercing, caliber. 50, M1¹— Standard.

Cartridge, armor piercing, caliber .50,

M1923^{1 2}----- Limited standard.

Cartridge, ball, caliber .50, M1----- Standard.

Cartridge, ball, caliber .50, M1923²----- Limited standard.

Cartridge, blank, caliber .50, M1^{3 4}----- Standard.

¹ Authorized for use in training in accordance with AR 775-10.

² Issued until supply is exhausted.

³ Only ammunition in which the closure is a thin paper cup or wad. Fibers from thick paper or felt wads tend to clog the gas port.

⁴ Chamber pressure insufficient to operate self-loading mechanism. Single shots may be fired by pulling back the retracting slide handle to extract the fired cartridge case. A feedway filler piece permits the shots to be fired from a link belt.

Cartridge, dummy, caliber .50, M1----- Standard.

Cartridge, tracer, caliber .50, M1----- Standard.

43. Data.—The maximum ranges and average velocities of the several types of models of caliber .50 ammunition authorized for use in the previously mentioned weapon are shown below :

Type and model of caliber .50 cartridges	Average velocity 78 feet from muzzle (feet per second)	Approximate maximum range (yards)
Cartridge, armor piercing, caliber .50, M1-----	2, 660	7, 500
Cartridge, armor piercing, caliber .50, M1923-----	2, 550	-----
Cartridge, ball, caliber .50, M1-----	2, 660	7, 500
Cartridge, ball, caliber .50, M1923-----	2, 550	-----
Cartridge, blank, caliber .50, M1-----	-----	-----
Cartridge, dummy, caliber .50, M1-----	-----	-----
Cartridge, tracer, caliber .50, M1-----	(*)	7, 500

*Caliber .50, M1, tracer ammunition, now loaded to group at 1,000 yards with ball and armor piercing.

44. Precautions in firing blank ammunition.—*a.* (1) It is dangerous to fire machine guns loaded with blank cartridges at personnel representing an enemy at distances of less than 20 yards as the wad or paper cup may fail to break up.

(2) Only blank ammunition closed with a thin paper cup or wad will be used in the machine gun.

b. Misfires in which the primer explodes but fails to ignite the powder charge may prove dangerous when blank ammunition is being fired. In misfire of this kind some of the powder may be blown into the bore of the weapon. A series of such rounds in which the powder fails to ignite due to moisture or other causes will result in an accumulation of powder sufficient to cause serious damage when ignited by a normal cartridge. When misfires are encountered in blank ammunition in excess of 5 percent, the firing of the lot will be suspended and the matter reported to the Chief of Ordnance.

45. Defects found after firing.—*a. Misfire.*—(1) Primer shows normal impression of firing pin. Such a misfire indicates that the primer is defective.

(2) Primer shows light impression of firing pin. Such a misfire indicates that the force of the blow struck by the firing pin was not sufficient to ignite the primer. This is generally caused by some mechanical defect in the weapon such as short or broken firing pin, a weak firing pin spring, the bolt of the weapon not being completely locked, or by grease in the firing pin hole in the bolt which cushion

the blow of the firing pin. It may also be caused by a defective cartridge or primer.

(3) Primer shows normal impression of firing pin but off center. This is caused by a defect in the weapon.

b. Hangfire.—Delayed ignition of the powder in the cartridge. This may be caused by a small or decomposed primer pellet, damp powder, or a light blow of the firing pin caused by dirt or a defect in the weapon. While a hangfire is a serious defect if the delay is long enough to permit the bolt to be opened before the powder burns completely, such delay is rarely found in practice. Should a hangfire of several seconds delay occur and the bolt be opened before the powder burns, injury to the firer or damage to the weapon, or both, may result.

c. Pierced primer.—Perforation of the primer cup by the firing pin. This may be caused by an imperfect firing pin, or very thin metal in the base of the primer cup. There are various degrees of this perforation. A very small perforation will show the escape of gas in or around the indent made by the firing pin. The disk from a large perforation may be blown into the action of the gun with such an escape of gas as to lower the velocity of the bullet.

d. Primer leak.—Gas generated by the explosion of the powder charge escapes between the walls of the primer cup and the primer pocket, causing discoloration around the primer and the head of the cartridge case. The discoloration may be slight indicating a small primer leak, or heavy indicating a large primer leak.

e. Blown primer.—On firing the cartridge the primer is blown completely from the pocket of the cartridge case. Although this is a serious defect, it is seldom encountered.

f. Primer set-back.—Pressure developed by the explosion of the propellant charge forces the primer back against the face of the bolt, and upon examination it will be seen that the primer protrudes slightly above the head of the cartridge case. The set-back of the primer may be slight or heavy, and is due to a defective bolt or cartridge.

g. Case leaked back.—The escape of gas into the action of the weapon, the discoloration due to this escape of gas being along the body of the cartridge case.

h. Case failed to extract.—This may be due to poorly formed or weak extractor, or a defective cartridge.

i. Blowback.—An escape of gas under pressure to the rear is commonly referred to as a blowback. Pierced primer, primer leak, blown

primer, primer set-back, and ruptured cartridge are known as blow-backs.

j. Split neck.—The neck of the cartridge case splits in firing and is accompanied by an escape of gas. Seasonal cracks are of two kinds; those which can be observed before firing and those which are evident after firing.

k. Split body.—A more or less regular longitudinal split in the body of the case which allows gas to escape.

l. Stretch.—A continuous ring around the body of a fired cartridge case which shows that the metal stretched when the cartridge was fired and that with slightly more stretching a complete or partial rupture would probably result. This is almost always due to improper head space.

m. Complete rupture.—A circumferential separation of the metal completely around the body of the fired cartridge case causing it to separate into two parts. If such a casualty occurs, upon extraction, the forward portion of the fired cartridge case remains in the chamber of the weapon. This is a serious defect, causing the next round of ammunition to jam. It is usually due to excessive head space or a defective cartridge case.

n. Partial rupture.—A partial circumferential separation around the body of the fired cartridge case. Like a complete rupture, this is a serious defect, as upon extraction the portion of the metal holding the two parts of the cartridge case may give way, thereby leaving the forward portion of the fired cartridge case in the chamber of the weapon. This defect is also usually due to excessive head space or a defective cartridge case.

46. Field reports of accidents.—Any serious malfunctions of ammunition must be promptly reported to the ordnance officer under whose supervision the material is maintained and issued (see par. 7, AR 45-30).

SECTION VIII

SPARE PARTS AND ACCESSORIES

Spare parts-----	Paragraph 47
Accessories-----	48

47. Spare parts.—*a. General.*—Parts become unserviceable through breakage or through wear resulting from continuous usage. For this reason certain parts are provided for replacement purposes. These parts are divided into two groups; spare parts and basic spare parts. The using arm has no concern with basic spare parts except

possibly in an emergency to draw a part from the ordnance maintenance company.

b. Spare parts.—These are extra parts provided with the matériel for replacement of those most likely to fail, and are for use by the using arms in making minor repairs. They should be kept clean and oiled to prevent rust. Sets of spare parts insofar as possible should be complete at all times. The allowances of spare parts for the subject matériel are prescribed in SNL A-37.

48. Accessories.—*a. General.*—Gun and mount accessories are those required for disassembling and assembling, and for cleaning, care, and preservation. They also include covers, tool roll, etc., necessary for storage, protection when the equipment is not in use, or when traveling. Battery accessories consist mainly of tools provided for general use. Accessories should not be used for purposes other than as prescribed. There are a number of accessories, the names or general characteristics of which indicate their use or application. Therefore, detailed description or methods of use are not outlined herein. Accessories embodying special features, however, or having special uses are described in the following subparagraphs.

b. Accessories for gun.—(1) *Brush, cleaning, caliber .50, M4.*—The brush consists of the core, bristles, and tip. The brass wire core is twisted in a spiral and holds the bronze bristles in place. The core is secured in the brass tip which is threaded for attaching the brush to the cleaning rod.

(2) *Case, cleaning rod, M1.*—The case is a fabric container with five pockets, four of which hold the sections of the jointed cleaning rod, M1, while the fifth holds the cleaning brush, caliber .50, M4. The contents are secured in their pockets by a web billet and chape with buckle.

(3) *Chest, water, caliber .50, M2.*—(a) *General description.*—This unit consists of a hand operated, rotary gear pump mounted in a steel chest with the necessary hose and connections. The pump is operated while firing, causing circulation of water, thereby keeping the gun barrel cool.

(b) *Method of connecting to machine gun.*—The water chest and the machine-gun water jacket should first be filled with water. In filling the water chest, unscrew the filler cap but do not remove the filler cap strainer. Then proceed as follows:

1. Remove the handhole cover from the pump compartment by taking out the eight screws.
2. Remove the union caps from the outlet and inlet ports.
3. Connect one hose from the outlet in the chest to the small hose connection bushing in the machine-gun water jacket.

4. Connect the other hose from the inlet in the chest to the large hose connection bushing in the machine-gun water jacket.
5. Replace the handhole cover, attach the crank, and place the chest so that the filler cap is at the top, as this is the only position in which the chest will function.

(c) *Method of operation.*—Turn the crank in a clockwise direction with a steady motion at the rate of approximately 35 revolutions per minute. This causes a steady stream of water to circulate through the water system. In order to make the most effective use of the water chest, the pump should be operated whenever bursts of 25 or more rounds are being fired, and continued without stop throughout the firing and thereafter until the temperature of the water in the machine gun is lowered to the temperature of water in the chest.

(d) *Method of removing and replacing pump.*

1. Remove the handhole cover from the pump compartment by taking out the eight screws.
2. Remove the union cap from pump outlet port.
3. Loosen the hose clamp on the short rubber hose inside the compartment and slide the hose off the connection.
4. Unscrew the three pump body screws which hold the pump in chest. In order to loosen one of the upper screws, the screw driver must be inserted through the hole in the large spur gear.
5. Remove pump from chest. If pump is to be disassembled, it must be done by ordnance personnel.
6. The pump is replaced in the chest in the reverse order to that in which removed.

Caution.—In replacing pump in chest, the three pump body screws should be screwed down gradually and evenly to avoid distortion of pump body and consequential misalignment of pump gear.

(e) *Care and cleaning.*

1. The block strainer which is attached to the check valve should be cleaned occasionally. This is done by removing the filler cap and filler cap strainer, inserting the arm through the hole and rubbing the finger or a brush across the face of the strainer.
2. When the water chest is not in service remove the filler cap and filler cap strainer, drain out the water, and thoroughly dry the interior by inserting the arm through the hole and wiping with waste or rags. Replace the filler cap strainer, filler cap, and the union caps of the inlet and outlet ports. Put the crank in the

pump compartment and screw the handhole cover in place.

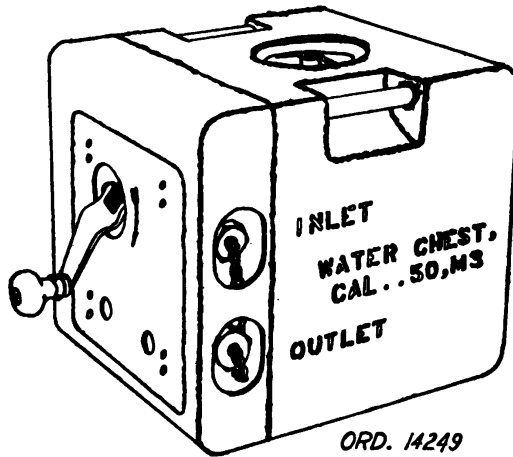


FIGURE 32.—Chest, water, caliber .50, M3.

NOTE.—Chest, water, caliber .50, M3, recently adopted as standard, with a capacity of 8 gallons, will be issued when it becomes available.

(4) *Cup, filling.*—The filling cup is used for filling the machine-gun water jacket. It consists of a conical shaped leather body having a small brass nozzle riveted to the bottom surface.

(5) *Machine, link loading, caliber .50, M2.*—The link loading machine (fig. 33) is used for rapid loading of ammunition into metallic links. It may be screwed to a bench, ammunition box, or other suitable support when in use, screw holes being provided in its base for this purpose. Links, properly assembled, are placed on the loading bed adjacent to the U-shaped stops, and cartridges are placed in the grooves provided. The loading is performed by the operation of the loading handle which, when pushed forward to the stop, will load the cartridges to the correct depth in the links. Care should be taken to handle properly that portion of the loaded belt that is adjacent to the section being loaded.

(6) *Oiler, filling, oil buffer.*—This oiler consists of 1½-pint capacity oilcan with a nozzle 5 inches long. It is used only for filling the oil buffer.

(7) *Rod, cleaning, jointed.*—This is a steel rod of five sections, the first two of which are permanently fastened together. The rear section is provided with a tubular steel handle which swivels on the rod. The first section has a slot formed for holding a cleaning patch and a threaded hole for attaching the cleaning brush.

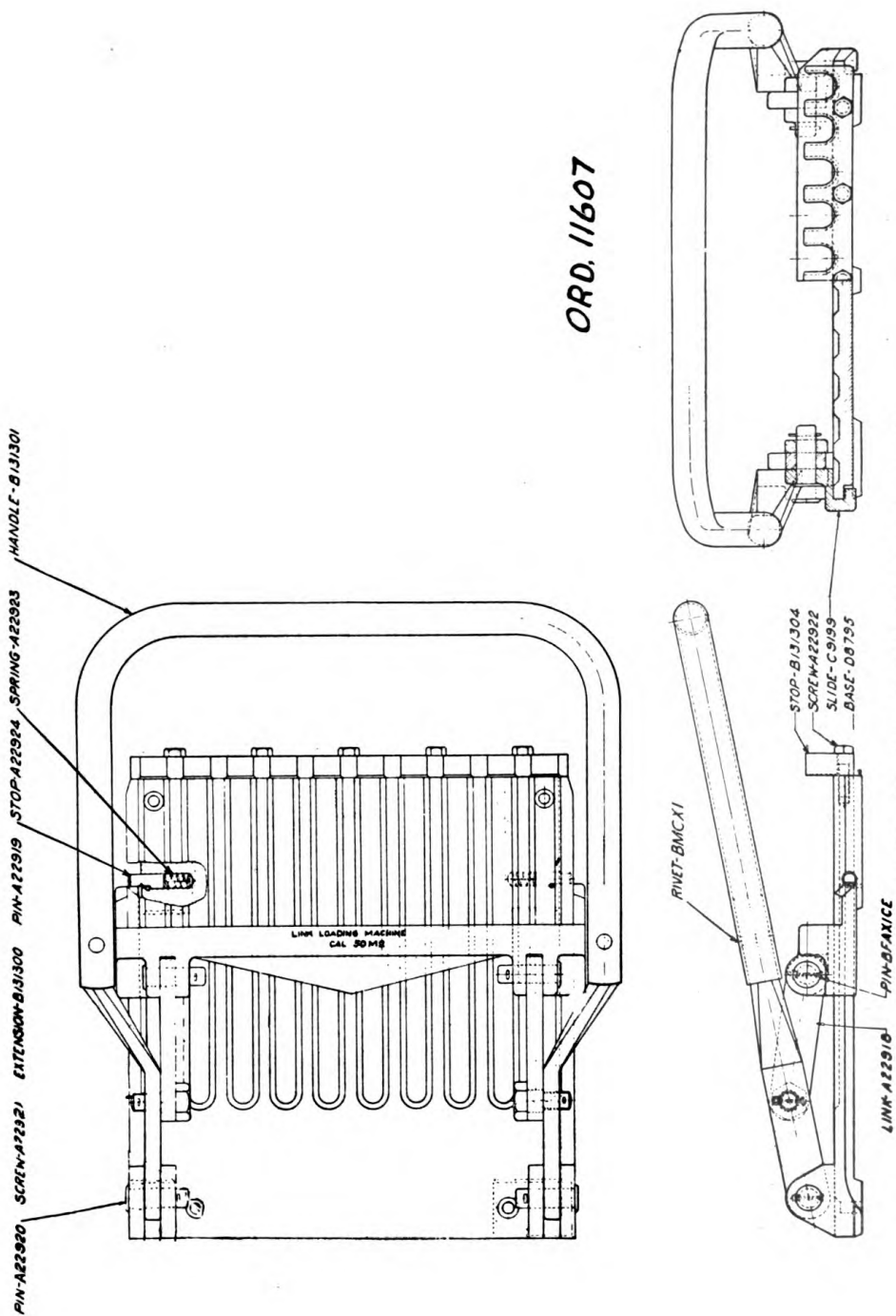


FIGURE 33.—Machine, link loading, caliber .50, M2.

(8) *Rod, cleaning*.—This rod consists of two sections permanently fastened together. The rear section is provided with a tubular steel handle which swivels on the rod. The front section has a threaded hole for attaching the cleaning brush and a slot for holding a cleaning patch.

(9) *Wrench, adjusting packing ring*.—This wrench which is used to turn the packing adjusting ring when adjusting the packing on the rear of the barrel is a single and spanner having its handle bent at an angle. At the end of the arc of the spanner a cylindrical lug is formed. When in use, this lug engages in one of the several holes formed in the packing adjusting ring.

(10) *Wrench, combination, M2 (fig. 34)*.—This is a special tool for disassembling, assembling, and making adjustments of the gun. Each opening and projection is marked to show its purpose.

(11) *Wrench, barrel holding*.—This wrench is used to hold the barrel when using the packing ring adjusting wrench. It is made of flat steel, $\frac{1}{8}$ inch thick, $\frac{7}{16}$ inch wide, and 3 inches long. One end is shaped to adapt it to the serrations and general contour of the barrel.

c. *Accessories for antiaircraft machine-gun mount, caliber, .50, M2*.—(1) *Bag, metallic belt link*.—This canvas bag is secured to the chute of the mount to catch the ejected metallic cartridge links.

(2) *Chest, ammunition, caliber .50, M2 (fig. 6③)*.—The ammunition chest provides a convenient means of handling and feeding belted ammunition. The chest is attached to the mount by means of slots on the sides of the chest. A removable crank is provided for use in loading the chest.

(a) *General description.*

1. The chest is made of steel and provided with a hinge so that the upper half may be swung back for purposes of filling and cleaning. Latches are provided for locking the upper half in place.
2. The upper half is provided with a spindle (reel) which is rotated by the removable crank, and a cartridge filler piece located around the spindle.
3. The lower half is provided with rollers to facilitate feeding, and a stop to prevent the ammunition from dropping back when the tension is released.

(b) *Method of filling chest.*

1. Lock the cartridge filler piece in place over the projecting fins on the spindle by means of the set screw in the filler piece. The position of the filler piece is dependent upon whether left- or right-hand feed is contemplated.

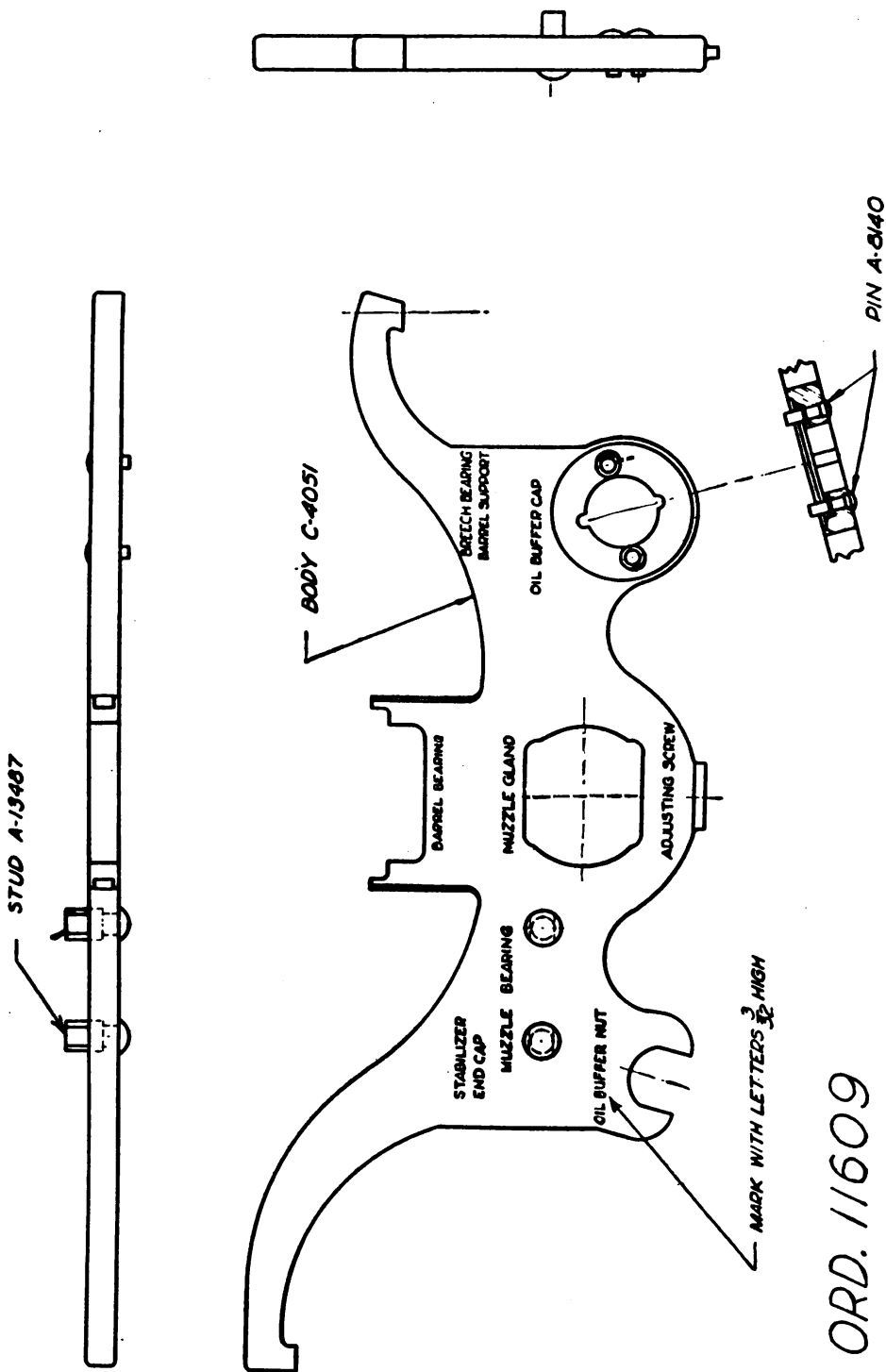


FIGURE 34.—Wrench, combination, M2.

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2. Pass the end of the ammunition belt around the spindle in direction of arrow stenciled on side of chest so that the end of the belt is uppermost. Place ammunition belt over cartridge filler piece so that the fins on filler piece and spindle are between the first and second cartridges.
3. Rotate the spindle in direction indicated by means of the crank. It may be necessary to hold the first layer of cartridges in place as the spindle is rotated.
4. Fill the spindle to approximately the height of upper half of chest. Pass the belt over hinge and down along back of lower half and along bottom of chest to the front. Then fill the lower half of chest in layers until the chest is filled to capacity (200 cartridges), and pass the first cartridge through the rollers.

(c) *Method of adjustment of spindle tension.*—The preferable tension on new chests is between 5 and 7 pounds when applied at the crank handle. A tension of 7 pounds is specified as chests will work at a somewhat reduced load after they have been worked in. To obtain the proper tension of 7 pounds proceed as follows:

1. Insert crank in spindle axle and attach a spring scale or a 7-pound weight to the crank handle.
2. Insert a screw driver through the hole in side of chest and adjust the click tube adjusting screw until the desired tension is obtained when the crank is in a horizontal position.

(d) *Care of chest.*—The chest must be kept closed and the inside clean to prevent grit from being carried into the action of the machine gun. The rollers and spindle bearings must be oiled occasionally.

(3) *Chest, sight.*—The sight chest (fig. 35) is for protection and storage of the sighting equipment, including the two front sight wrenches.

(4) *Wrench, adjusting, recoil spring.*—This wrench (fig. 35) consists of a tubular body with a handle at one end and two lugs at the other end. It is inserted in the bearing (7) of the recoil mechanism and fitted into the slots of the adjusting plug (nut) (13), shown in figure 7. Thereby the adjusting plug (nut) (13) may be turned in either direction until the proper adjustment of the spring (8) is obtained.

(5) *Wrenches, spanner* (fig. 35).—(a) The flat key type spanner wrench has a circular end and is used to turn the adjusting plug (15) shown in figure 7 until the proper adjustment of spring (11) is obtained.

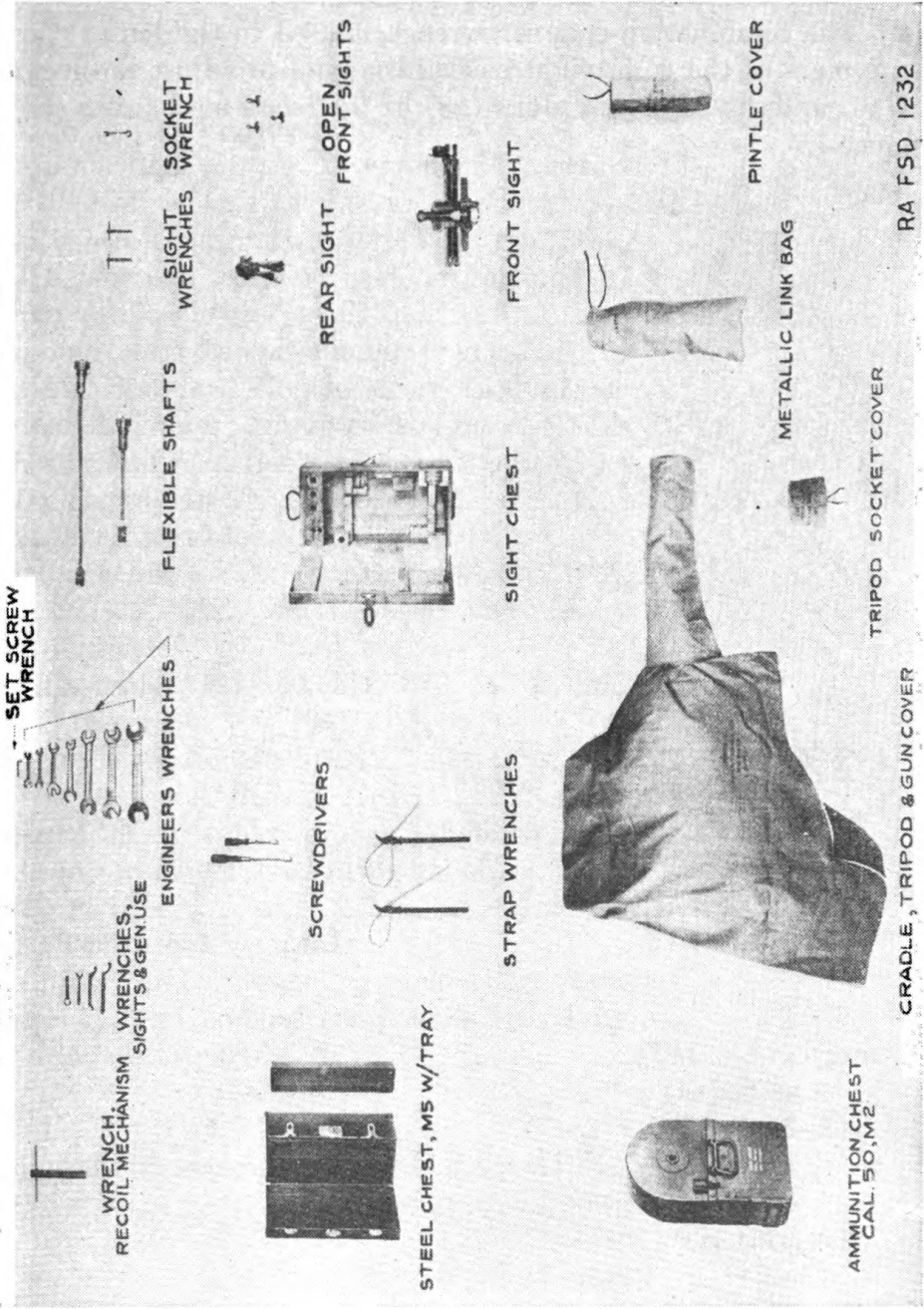


FIGURE 35.—Accessories for antiaircraft machine-gun mount, caliber .50, M2.

(b) The pin type spanner wrench is used in connection with adjusting various components of the front sight mechanism.

(c) The hook spanner wrench is used to adjust the locking nuts (12) of the recoil mechanism shown in figure 7.

(d) The combination spanner wrench is used to tighten or loosen the adapters of the front sight mechanism, and to adjust the locking nut (16) and the adjusting plugs (28) of the recoil mechanism shown in figure 7.

APPENDIX

LIST OF REFERENCES

1. Standard nomenclature lists.

- Gun, machine, cal. .50, Browning, M2, water-cooled—fixed and flexible, and mount----- SNL A-37.
- Set, control equipment, automatic gun, AA, M1 (for cal. .50 AA machine gun and 37 mm automatic gun)----- SNL F-182.
- Ammunition, rifle and automatic gun----- SNL T-1.
- Current Standard Nomenclature Lists are as tabulated here. An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index"----- (OPSI).

2. Firing tables.

- Gun, machine, cal. .50, Browning, M1921, M1921A1, M2, water-cooled and heavy barrel:
- Cartridge, cal. .50, M1, ball, A. P. and tracer:
- Antiaircraft fire----- FT 0.50-AA-E-4.
- Ground fire----- FT 0.50-F-2.
- Current firing tables are as tabulated here. An up-to-date list of firing tables is maintained in----- SNL F-69.

3. Technical manuals.

- Cleaning and preserving materials, oils, greases, and cutting compounds issued by Ordnance Department----- TM 9-850 (now published as TR 1395-A).
- Ammunition, general----- TM 9-900 (now published as TR 1370-A).

4. Field manual.

**Marksmanship and service of the piece, anti-
aircraft machine gun----- FM 4-135.**

[A. G. 062.11 (8-17-40).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
The Adjutant General.

